REPORT

FROM THE

SELECT COMMITTEE

ON

SHANNON RIVER;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

MINUTES OF EVIDENCE,

AND APPENDIX.

Ordered, by The House of Commons, *to be Printed,*
18 *May* 1868.

277.

Thursday, 20th February 1868.

Ordered, THAT a Select Committee be appointed to inquire into the manner in which the drainage and navigation of the River Shannon has been carried out under the direction of Her Majesty's Government, and what steps should be taken to complete the work for which a compulsory levy of 300,000 *l.* has been made on the adjoining counties.

Tuesday, 17th March 1868.

Committee nominated of,—

Colonel French.
Mr. William Ormsby Gore.
Sir Edward Dering.
Mr. Acland.
Mr. Gregory.
Mr. Sclater-Booth.
General Dunne.
Mr. Laird.
Mr. Agar-Ellis.
Colonel Vandeleur.
Mr. Bonham-Carter.
Mr. Pollard-Urquhart.
Sir Graham Montgomery.

Ordered, THAT the Committee have power to send for Persons, Papers, and Records.

Ordered, THAT Five be the Quorum of the Committee.

Wednesday, 25th March 1868.

Ordered, THAT the Reports of the Select Committee on Shannon River, of 1865 and 1866, be referred to Select Committee on Shannon River.

Friday, 27th March 1868.

Ordered, THAT the Copy of the Report of the Select Committee of the House of Lords on the River Shannon Navigation and Drainage, which was communicated to this House on the 4th July 1865, be referred to Select Committee on Shannon River.

Monday, 18th May 1868.

Ordered, THAT the Committee have power to report their Observations, together with the Minutes of Evidence taken before them, to The House.

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R E P O R T.

THE SELECT COMMITTEE appointed to inquire into the manner in which the **DRAINAGE** and **NAVIGATION** of the **RIVER SHANNON** has been carried out under the direction of Her Majesty's Government, and what steps should be taken to complete the work for which a compulsory Levy of 300,000 *l.* has been made on the adjoining Counties;——HAVE considered the Matters to them referred, and have agreed to the following REPORT: –

IN the year 1865, a Committee of the House of Commons was appointed to inquire into the manner in which the drainage and navigation of the River Shannon had been carried out under the direction of Her Majesty's Government, and to report what steps should be taken to complete the works for which a compulsory levy of 300,000 *l.* has been made on the adjoining counties. This Committee, owing to the lateness of the Session at which the inquiry commenced, proceeded no further than to report the evidence taken before it to the House. In 1866, the Committee sat again and took further evidence, but was adjourned to give time to Mr. Bateman on the part of the Treasury, and to Mr. Lynam on the part of the proprietors, to re-consider the engineering portion of the question, and to draw up reports with estimates. In the present year, having before them the reports of Mr. Bateman and Mr. Lynam, both of whom have been examined, having also the Report of the Committee of the House of Lords in 1865 which went fully into the subject, and other reports and documents connected with the River Shannon, its navigation and drainage, referred to them, they have arrived at the following Report:—

That the lands along the banks of the Shannon for a distance of 150 miles have been exposed to floods, which render cultivation precarious, impede industry, and by the saturation of many thousands of acres affect the climate of the district through which it flows.

That for many years continual remonstrances had been made to successive Governments to induce them to take into consideration this state of things, and to provide a remedy. In consequence of this, so far back as 1821, Sir John Rennie was appointed by the Government "to make a survey of the river as to its levels between Killaloe and Roosky, with a view to lower its surface, in order that the water from the bogs lying on each side of it might be more readily got off." In 1831 a more full and minute survey was ordered to be made under Colonel Burgoyne, of the Board of Works, for the double object of improving the navigation and preventing inundations. Mr. Stanley, then Chief Secretary, in issuing instructions stated, "that an inquiry should be made as to the beneficial result which might be expected from a judicious expenditure of capital upon the River Shannon, both with reference to improvement of the navigation, and also to the reclaiming of vast tracts of land, now either submerged periodically by the flood of the river and its tributary streams, or rendered incapable of cultivation from the accumulations which are unable to find a vent. Reports were made in pursuance of these instructions, and the Act of Parliament 5 & 6 Will. 4, c. 67, called, an Act for the Improvement of the Navigation of the Shannon, was passed; it recognised drainage to be its object as well as navigation, and in the 4th section enacts, "that maps and plans should be made out for confining the waters of the Shannon, and preventing the inundation of the contiguous lands." The Reports of the Shannon Commissioners give the strongest assurances that by means of the works proposed to be executed, the lands shall be freed from inundations, and may be tilled.*

That on the basis of these official reports the Act 2 & 3 Vict. c. 61, was passed in August 1839, by which it was enacted in the first section, "That the several works mentioned and described in the maps and plans aforesaid, shall be carried into full and complete execution, subject, however, to any alterations to be made therein pursuant to the power hereinafter provided;" and that a sum of 584,807 *l.* should be issued from the Consolidated Fund to defray the cost of the proposed works, by which the sum of 290,717 *l.* should be a grant, and the sum of 294,090 *l.* by way of loan, to be repaid as provided, viz., by proprietors for landing piers on the Lower Shannon, 27,755 *l.*; by the counties, 266,334 *l.*

That for the object of drainage, as well as for navigation, and in full reliance on the pledge that the works specified on the maps should be carried into full and complete execution, the counties submitted to be taxed, and have paid in full the amount at which they have been assessed.†

That the plans approved of by Parliament for those works have been departed from in a manner which has contributed to prevent their success; and although the sanction of the Treasury was necessary for any deviation, and was obtained in one or two instances at and above Athlone, no record is to be found of any sanction being asked for by the Commissioners for the still more important omissions and deviations made below that town. Nor were such deviations in any instance made known to Parliament, to the public, or to the residents in the localities. In this opinion your Committee are strengthened by the unanimous Report of the Committee of the House of Lords on the same point.

That the Commissioners originally designed the maps and plans and drew up the specifications, yet, contrary to usage, they did not contract for the works, but undertook to execute them themselves. They thus became judges of their own works and approved of them, although these works were not executed in accordance with the original plans.

That they applotted the cost of the works upon the counties as if they had been actually completed.

That the Legislature as well as successive Governments, having proposed to confine the waters of the Shannon and prevent the inundations, and to carry into full execution the completion of the works necessary for that purpose, your Committee are of opinion that the Government is bound to carry out the engagements on the faith of which the counties have taxed themselves, and have paid in full their obligations. It has been shown by the Government valuators, Messrs. Brassington & Gale, that 24,000 acres on the Shannon, and it has also been stated that 72,000 acres on the Suck, are every year more or less injured by floods. Your Committee consider that an Act of Parliament should be passed, providing for the execution of the works necessary to prevent inundations by summer and autumn floods, and for levying off the lands to be improved a sum equivalent to the increase on the annual letting value of the lands to be caused by this drainage.

That, although from the terms of reference your Committee has been precluded from investigating into the value of the Shannon navigation, yet, as the navigation and drainage are necessarily combined, they have incidentally received evidence that there is no passenger traffic either on the Upper or Lower Shannon, that the goods traffic on the Upper Shannon is merely nominal, and that, owing to the formation of railroads competing with water carriage, the same traffic on the Lower Shannon has become comparatively insignificant. It has also been stated that the chief cause of ordinary inundations is the fact that

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* Mr. Nicholson's (valuator to the Shannon Commissioners) report, 31 May 1838, printed with Third Report Shannon Commissioners.

† Memorial of Lords Clanricarde and Clancarty, 1825, in Mr. Grantham's report, presented to Parliament 9th March 1831.

that the Board of Works maintain, during the greater part of every year, several feet greater depth of water than is wanted by the present steamers or warranted by Act of Parliament; and your Committee are of opinion that though the navigation should be maintained, it is inexpedient that a depth of water should be required which was not originally laid down in the Parliamentary plans, and which is totally at variance with that which is found sufficient for the navigation of other rivers and lakes in foreign countries.

Your Committee are also of opinion that in any scheme for the improvement of the Shannon drainage the tributaries should be considered, and that the eel weir at Rooskey should be immediately removed.

18 *May* 1868.

PROCEEDINGS OF THE COMMITTEE.

Friday, 20*th March* 1868.

MEMBERS PRESENT:

Colonel French.
General Dunne.
Mr. Ormsby Gore.
Mr. Gregory.
Mr. Pollard-Urquhart.
Colonel Vandeleur.
Mr. Bonham-Carter.

Colonel *French* was called to the Chair.

The Committee deliberated.

[Adjourned till Friday next, at Twelve o'clock.

Friday, 27*th March* 1868.

MEMBERS PRESENT:

Colonel FRENCH in the Chair.

General Dunne.
Mr. Ormsby Gore.
Mr. Sclater-Booth.
Mr. Gregory.
Sir Graham Montgomery
Mr. Pollard-Urquhart.
Mr. Bonham-Carter.
Colonel Vandeleur.
Mr. Acland.
Mr. Agar-Ellis.
Mr. Laird.

The Committee deliberated.

Motion made, and Question proposed, "That the Committee proceed to consider Resolutions as was agreed at their last meeting"—(General *Dunne*).—Amendment proposed, to leave out from the word "That" to the end of the Question, in order to add the words "the Committee adjourn till Thursday, the 30th of April, for the purpose examining witnesses"—(Mr. *Sclater-Booth*)—instead thereof.—Question, That the words proposed to be left out stand part of the Question—put, and *negatived*.—Words added—main Question, as amended, put, and *agreed to*.—*Resolved*, That the Committee do adjourn till Thursday the 30th of April, for the purpose of examining Witnesses.

[Adjourned till Thursday, the 30th April, at Twelve o'clock.

Thursday, 30*th April* 1868.

MEMBERS PRESENT:

Colonel FRENCH in the Chair.

Mr. Pollard-Urquhart.
Mr. Sclater-Booth.
Colonel Vandeleur.
Mr. Ormsby Gore.
Mr. Bonham-Carter.
Sir Graham Montgomery.
Mr. Gregory.
Mr. Acland.
Mr. Agar-Ellis.

Colonel *M'Kerlie* examined.

[Adjourned till Tuesday next, at Twelve o'clock

Tuesday, 5th May 1868.

MEMBERS PRESENT:

Colonel French in the Chair.

Mr. Gregory.
Mr. Bonham-Carter.
Mr. Pollard-Urquhart.
Mr. Ormsby Gore.
Colonel Vandeleur.
Sir Graham Montgomery.
Mr. Sclater-Booth.
Mr. Laird.
Mr. Agar-Ellis.

The Committee deliberated.

Mr. *W. Forsyth* examined.

[Adjourned till Thursday next, at Twelve o'clock.

Thursday, 7th May 1868.

MEMBERS PRESENT:

Colonel French in the Chair.

Mr. Bonham-Carter.
Mr. Gregory.
Mr. Sclater-Booth.
Mr. Laird.
Mr. Pollard-Urquhart.
Colonel Vandeleur.
Sir Graham Montgomery.
Mr. Ormsby Gore.
Mr. Agar-Ellis.

Mr. *James S. Penny* and Mr. *James Lynam* were severally examined.

[Adjourned till Monday next, at One o'clock.

Monday, 11th May 1868.

MEMBERS PRESENT:

Colonel French in the Chair.

Mr. Ormsby Gore.
Mr. Sclater-Booth.
Mr. Gregory.
Mr. Bonham-Carter.
Mr. Agar-Ellis.
Mr. Pollard-Urquhart.
Sir Graham Montgomery.
Colonel Vandeleur.

Mr. *J. F. Bateman* examined; Mr. *James Lynam* further examined.

[Adjourned till Monday next, at Twelve o'clock.

Monday, 18th May 1868.

MEMBERS PRESENT:

Colonel French in the Chair.

Mr. Gregory.
Mr. Pollard-Urquhart.
Mr. Bonham-Carter.
General Dunne.
Sir Graham Montgomery.
Mr. Sclater-Booth.
Mr. Ormsby Gore.
Mr. Acland.

Draft Report proposed by the *Chairman*, read the first time, as follows:

"1. That the Committee have met and considered the evidence taken in the years 1865 and 1866, which has been referred to them, and have agreed to the following Report:—

"2. That the works for the improvement of the drainage and navigation of the Shannon, and for confining the waters thereof, and preventing the inundation of the contiguous lands, executed under the Acts of 5 & 6 Will. 4, c. 67 and 2 & 3 Vict. c. 6, have not been successful, considering the amount of money expended upon them.

"3. That the plans approved of by Parliament for those works have been departed from in a manner which has contributed to prevent their success; and although the sanction of the Treasury was necessary for any deviation, no record is to be found, except in one instance, of any sanction being asked for by the Commissioners. Nor were such deviations in any instance made known to Parliament, to the public, or to the residents in the localities.

"4. That these departures were caused by errors of judgment on the part of the Commissioners entrusted with the execution of the works.

"5. That the Commissioners originally designed the maps and plans and drew up the specifications, yet, contrary to usage, they did not contract for the works, but undertook to execute them themselves. They thus became judges of their own works and approved of them, although these works were not executed in accordance with the original plans.

"6. That they applotted the cost of the works upon the counties as if they had been actually completed.

"7. That under these circumstances, a sum amounting to 390,000*l.* was unjustly levied by compulsory presentment upon the counties, and your Committee are of opinion that, in justice to those counties, and all the works originally undertaken to be executed, should be completed without any further contribution from them.

"8. Colonel M'Kerlie, Chairman of the Board of Public Works in Ireland, having handed in a statement from that Board, he not having been employed on the Shannon, your Committee have considered the same, and are of opinion that it contains a full admission that the works have not been carried out according to the plans approved of by Parliament, for the due and proper execution of which the several counties were taxed; and that the inefficient state of the navigation, and the confined discharge of the waters of the river, and consequent injury to large tracts of land, are the result of the devastations from, and the non-fulfilment of the works defined by those plans.

"9. The Board of Works state, that the question raised is, whether the Commissioners failed to fulfil the intentions of the Legislature; we consider that the Commissioners had no especial instructions from the Legislature, other than to carry out the works as laid down by the Parliamentary plans, which were given them in charge to execute; and that the counties taxed have been deprived of benefits promised, and which would have been conferred, if the works had been executed as approved of by Parliament.

"10. The Commissioners took years to consider, and expended large sums on investigations and inquiries as to estimates and otherwise, but they admit that they raised the weirs above the Parliamentary levels, for the purpose of cheapening the works by avoiding excavations; and that for the same reason they have not cut several shoals and narrows to the breadth required by the plans. We are of opinion that their having raised weirs above the proper height, and not having cut shoals to the proper width and depth, has caused a raising of the waters above the height to which they would have arisen, had the works been duly executed; and that, in consequence, the lands have not been relieved as they would have been had the plans approved of by Parliament been carried into effect; and also, that from the shoals having been left narrower than the plans, show a greater force of current necessarily arises, which causes much difficulty to vessels passing through them.

"11. It is stated that the Commissioners, in five reports referred to, entertained doubts as to the perfection of drainage, therefore did not recommend especial charge therefor; but they did not express any doubt as to the perfection of the navigation. The evidence of Captain Winder and others, however, show it to result in disappointment; it is also in evidence before us that several quays, built of solid stonework by the Commissioners, have been flooded, and that vessels are embarrassed in finding the river course to steer in during floods.

"12. That authority from the Treasury was given to the Commissioners to alter the plans for the purpose of saving expenditure is matter of doubt; it may also be doubted whether the intention of the Legislature, on passing the Act, was that the Treasury should have power to order any alterations prejudicial to the interests of the navigation, or of the ratepayers of the counties taxed, without publicity of any kind. And, also, whether the Commissioners acted with good faith to the country, the Treasury, and to Parliament, in withholding from them publicity, through their 11 annual reports, that they had raised weirs above the Parliamentary heights, and avoided cutting bars in the river, to the full breadth, on the grounds of insufficiency of estimate, or on any other grounds.

"13. That the withholding of this information from the counties, as well as from Parliament, denuded the ratepayers of the counties, who were compulsorily taxed, from seeking redress, by memorial or otherwise, against the insufficiency of the works then under execution by the Commissioners.

Draft Report proposed by Mr. *Sclater-Booth*, read first time, as follows:

"1. THAT the works for the improvement of the navigation of the Shannon were commenced in the year 1841, under the Act 2 & 3 Vict., c. 61, preceded by an inquiry, under a previous Act, 5 & 6 Will. 4, c. 67, and were completed in the year 1850.

"2. That the sum of 584,807 *l.*, being the maximum sum authorised by the said Act, was expended in the execution of the works, of which the sum of 302,539 *l.* was made a free grant by Parliament, and the residue, amounting to a sum of 282,268 *l.* was advanced by way of loan, to be repaid by the city of Limerick, and counties and baronies adjacent to the river, and interested in the navigation thereof under the awards of the Commissioners.

"3. That the half-yearly instalments of the respective sums so apportioned on the several counties, &c., were contributed regularly, and the final payments were completed in the year 1859.

"4. That the works appear to have been well executed for the improvement of the navigation for which they were designed; and that benefit has incidentally accrued to the adjacent lands by the lowering of the levels of the water in the river, though not to so great an extent as might have been anticipated by the owners; but, on the other hand, it must be observed that whereas power was given by the Act of Parliament to charge the proprietors of the lands so improved in respect of benefit derived from the works, such power was not exercised, so that no complaint on the score of inadequate drainage of their lands could arise on the part of the proprietors, even if it were otherwise practicable, after so great a lapse of time, to re-open the terms and conditions under which the works were carried out.

"5. Claims have been made for further expenditure on the part of the Government, based on the allegation that deviations from the original scheme have been in some cases made without proper authority; but it seems to your Committee unnecessary to enter upon the consideration of that allegation, inasmuch as it has been proved to their satisfaction that the works have been on the whole beneficial, and in no case injurious to the drainage of the lands.

"6. Your Committee concur in the opinion expressed by the Committee of the House of Lords, which has been referred to them, that there appear to be no sufficient grounds for applying to Parliament for a further grant of money towards the improvement of the Shannon.

"7. In the event, however, of the proprietors being desirous of charging their lands for purpose of works of drainage, it would be for the Government to consider whether, in the execution of such works, the opportunity might offer of effecting improvements in the navigation of the river at certain points, for which a contribution, on their part, would be reasonable.

"8. But, after inquiring into the plans which have been laid before them by Mr. Bateman and Mr. Lynam, it does not appear to your Committee that any complete drainage of the basin of the Shannon can be effected except at a cost far exceeding the value of the improvements which could be realised."

Draft Report proposed by Mr. *Gregory*, read first time, as follows:

"IN the year 1865, a Committee of the House of Commons was appointed to inquire into the manner in which the drainage and navigation of the River Shannon had been carried out under the direction of Her Majesty's Government, and to report what steps should be taken to complete the works for which a compulsory levy of 300,000 *l.* has been made on the adjoining counties. This Committee, owing to the lateness of the Session at which the inquiry commenced, proceeded no further than to report the evidence taken before it to the House. In 1866 the Committee sat again and took further evidence, but was adjourned to give time to Mr. Bateman on the part of the Treasury, and to Mr. Lynam on the part of the proprietors, to reconsider the engineering portion of the question, and to draw up reports with estimates. In the present year, having before them the reports of Mr. Bateman and Mr. Lynam, both of whom have been examined, having also the Report of the Committee of the House of Lords in 1865, which went fully into the subject, and other reports and documents connected with the River Shannon, its navigation and drainage, referred to them, they have arrived at the following Report:—

"1. That the lands along the banks of the Shannon for a distance of 150 miles have been long exposed to constant floods, which render cultivation precarious, impede industry, and by the saturation of many thousands of acres, affect the climate of the district through which it flows.

"2. That for many years continual remonstrances had been made to successive Governments to induce them to take into consideration this state of things, and to provide a remedy. In consequence of this, so far back as 1821, Sir John Rennie was appointed by the Government 'to make a survey of the river as to its levels between Killaloe and Roosky,

Roosky, with a view to lower its surface, in order that the water from the bogs lying on each side of it might be more readily got off.' In 1831 a more full and minute survey was ordered to be made under Colonel Burgoyne, of the Board of Works, for the double object of improving the navigation and preventing inundations. Mr. Stanley, then Chief Secretary, in issuing instructions stated, 'that an inquiry should be made as to the beneficial result which might be expected from a judicious expenditure of capital upon the River Shannon, both with reference to improvement of the navigation, and also to the reclaiming of vast tracts of land, now either submerged periodically by the flood of the river and its tributary streams, or rendered incapable of cultivation from the accumulations which are unable to find a vent. On the strength of these reports, the Act of Parliament 5 & 6 Will. 4, c. 67, called, an Act for the Improvement of the Navigation of the Shannon, was passed; it recognised drainage to be its object as well as navigation, and in the 4th section enacts, 'that maps and plans should be made out for confining the waters of the Shannon, and preventing the inundation of the contiguous lands.' The Reports of the Shannon Commissioners give the strongest assurances that by means of the works proposed to be executed, the lands shall be freed from inundations, and may be tilled.*

"3. That on the basis of these official reports the Act 2 & 3 Vict. c. 61, was passed in August 1839, by which it was enacted in the first section, 'That the several works mentioned and described in the maps and plans aforesaid, shall be carried into full and complete execution, subject, however, to any alterations to be made therein pursuant to the power hereinafter provided;' and that a sum of 384,807 *l.* should be issued from the Consolidated Fund to defray the cost of the proposed works, by which the sum of 290,717 *l.* should be a grant, and the sum of 294,090 *l.* by way of loan, to be repaid as provided, viz., by proprietors for landing piers on the Lower Shannon, 27,755 *l.*; by the counties, 266,334 *l.*

"4. That for the object of drainage, quite as much as for navigation, and in full reliance on the pledge that the works specified on the maps should be carried into full and complete execution, the counties submitted to be taxed, and have paid in full the amount at which they have been assessed.†

Committee, Lords' Report, 1865.

"5. That the works were commenced in 1840 by the Government Commissioners, under the Act 2 & 3 Vict. c. 61, and were carried on till 1850, when they were left unfinished. That large and important portions of these works still remain to be completed, and your Committee consider that they cannot do better than to quote from the Committee of the House of Lords the paragraph referring to the course preferred by the Board of Works, in which your Committee entirely coincide.

> 'That the plans allowed by Parliament for those works have been departed from in several instances, in a manner which has contributed to prevent their complete success; furthermore, it appears that although the sanction of the Treasury was obtained for the deviations from the Parliamentary plans at and above Athlone, no record is to be found of any such sanction for the still more important omissions and deviations made below that town. Nor were these omissions and deviations in any instance made known to Parliament, to the public, or to the residents in the localities.'

"6. That, although from the terms of reference your Committee has been precluded from investigating into the value of the Shannon navigation, yet, as the navigation and drainage are necessarily combined, they have incidentally received evidence that there is no passenger traffic either on the Upper or Lower Shannon, that the goods traffic on the Upper Shannon is merely nominal, and that, owing to the formation of railroads competing with water carriage, the same traffic on the Lower Shannon has become comparatively insignificant. It has also been stated that the chief cause of ordinary inundations is the fact that the Board of Works maintain, during the greater part of every year, several feet greater depth of water than is wanted by the present steamers, or warranted by Act of Parliament; and your Committee are of opinion that though the navigation should be maintained, it is inexpedient that a depth of water should be required which was not originally laid down in the Parliamentary plans, and which is totally at variance with that which is found sufficient for the navigation of other rivers and lakes in foreign countries.

"7. Your Committee have had before them the plans of Mr. Bateman and Mr. Lynam, for improving the drainage of the Shannon, and while they are not prepared to pronounce an opinion upon disputed points of engineering science, are nevertheless of opinion that experiments which can be effected at a small outlay, should at once be proceeded with at Killaloe, for the purpose of ascertaining how the sluices proposed by Mr. Bateman, Mr. Lynam, and Mr. Forsyth, would act on the navigation and the drainage of that portion of the river between Killaloe and Meelick, which is the best pattern of sluice, and what improvements could be made upon it.

"8. That the Legislature, as well as successive Governments, having proposed to confine the waters of the Shannon and prevent the inundations, and to carry into full and complete

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* Mr. Nicholson's (valuator to the Shannon Commissioners) Report, 31st May 1838, printed with Third Report Shannon Commissioners.

† Memorial of Lords Clanricarde and Clancarty, 1825, in Mr. Grantham's Report, presented to Parliament 9th March 1831.

complete execution the completion of the works necessary for that purpose, your Committee are of opinion that the Government is bound to carry out the engagements on the faith of which the counties have taxed themselves, and have paid in full their obligations. It has been shown by the Government valuators, Messrs. Brassington & Gale, that 24,000 acres on the Shannon, and it has also been stated that 72,000 acres on the Suck, are every year more or less injured by floods. Your Committee consider that an Act of Parliament should be passed in the present Session, providing for the execution of the works necessary to prevent inundations by summer and autumn floods, and for levying off the lands to be improved a sum equivalent to the increase on the annual letting value of the lands to be caused by this drainage.

"9. Your Committee are also of opinion that in any scheme for the improvement of the Shannon drainage, the districts of the Suck, as well as those of the Camlin, Fallon, Lough Allen, and other tributaries, should be considered."

Motion made, and Question proposed, "That the Draft Report proposed by the Chairman be now read a second time, paragraph by paragraph."—(The *Chairman*.) Amendment proposed, to leave out the words "the Chairman," in order to insert the words "Mr. Sclater-Booth"—(Mr. *Sclater-Booth*),—instead thereof. Question put, That the words "the Chairman" stand part of the Question.—The Committee divided:

Ayes, 4.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Pollard-Urquhart.	Sir Graham Montgomery.

Whereupon the Chairman declared himself with the *Ayes*.

Draft Report proposed by the *Chairman*, read a second time, paragraph by paragraph.

Paragraph 1.—Amendment proposed to leave out from the word "That" to the end of the paragraph, in order to add the words "In the year 1865, a Committee of the House of Commons was appointed to inquire into the manner in which the drainage and navigation of the River Shannon had been carried out under the direction of Her Majesty's Government, and to report what steps should be taken to complete the works for which a compulsory levy of 300,000 *l.* has been made on the adjoining counties. This Committee, owing to the lateness of the Session at which the inquiry commenced, proceeded no further than to report the evidence taken before it to The House. In 1866, the Committee sat again and took further evidence, but was adjourned to give time to Mr. Bateman on the part of the Treasury, and to Mr. Lynam on the part of the proprietors, to reconsider the engineering portion of the question, and to draw up reports with estimates. In the present year, having before them the reports of Mr. Bateman and Mr. Lynam, both of whom have been examined, having also the Report of the Committee of the House of Lords in 1865, which went fully into the subject, and other reports and documents connected with the River Shannon, its navigation and drainage, referred to them, they have arrived at the following Report"—(Mr. *Gregory*), instead thereof. Question, That the words proposed to be left out stand part of the paragraph—put, and *negatived*. Words *added*—Paragraph as amended, *agreed to.*

Paragraph 2.—Amendment proposed, to leave out from the word "That" to the end of the Question, in order to add the words:—"That the lands along the banks of the Shannon, for a distance of 150 miles, have been exposed to floods, which render cultivation precarious, impede industry, and by the saturation of many thousands of acres affect the climate of the district through which it flows.

"That for many years continual remonstrances had been made to successive Governments to induce them to take into consideration this state of things, and to provide a remedy. In consequence of this, so far back as 1821, Sir John Rennie was appointed by the Government 'to make a survey of the river as to its levels between Killaloe and Roosky, with a view to lower its surface, in order that the water from the bogs lying on each side of it might be more readily got off.' In 1831 a more full and minute survey was ordered to be made under Colonel Burgoyne, of the Board of Works, for the double object of improving the navigation and preventing inundations. Mr. Stanley, then Chief Secretary, in issuing instructions, stated 'that an inquiry should be made as to the beneficial result which might be expected from a judicious expenditure of capital upon the river Shannon, both with reference to improvement of the navigation, and also to the reclaiming of vast tracts of land, now either submerged periodically by the flood of the river and its tributary streams, or rendered incapable of cultivation from the accumulations which are unable to find a vent.' Reports were made in pursuance of these instructions, and the Act of Parliament, 5 & 6 Will. 4, c. 67, called, an Act for the Improvement of the Navigation of the Shannon, was passed; it recognised drainage to be its object as well as navigation, and in the 4th section enacts, 'that maps and plans should be made out for confining the waters of the Shannon, and preventing the inundation of the contiguous lands.' The reports of the Shannon Commissioners give the strongest assurances that by means of the works proposed to be executed, the lands shall be freed from inundations, and may be tilled.

"That on the basis of these official reports, the Act 2 & 3 Vict. c. 61, was passed in August 1839, by which it was enacted in the first section, 'That the several works mentioned and described in the maps and plans aforesaid, shall be carried into full and complete execution, subject, however, to any alterations to be made therein pursuant to the power hereinafter provided;' and that a sum of 584,807 *l.* should be issued from the Consolidated Fund to defray the cost of the proposed works, by which the sum of 290,717 *l.* should be a grant, and the sum of 294,090 *l.* by way of loan, to be repaid as provided, viz., by proprietors for landing piers on the Lower Shannon, 27,755 *l.*; by the counties, 266,334 *l.*

"That for the object of drainage, as well as for navigation, and in full reliance on the pledge that the works specified on the maps should be carried into full and complete execution, the counties submitted to be taxed, and have paid in full the amount at which they have been assessed."

Question put, That the words "The works for the improvement," stand part of the paragraph.—The Committee divided:

Ayes, 4.	Noes, 4.
Mr. Acland.	Mr. Ormsby Gore.
Mr. Sclater-Booth.	Mr. Gregory.
Mr. Bonham-Carter.	General Dunne.
Sir Graham Montgomery.	Mr. Pollard-Urquhart.

Whereupon the Chairman declared himself with the *Noes.*

Question proposed, That the proposed words be added after the word "That," in paragraph 2.—Amendment proposed to the proposed Amendment, by leaving out the words, "it recognised drainage to be its object as well as navigation"—(*Mr. Sclater-Booth*).—Question put, That those words stand part of the proposed Amendment.—The Committee divided:

Ayes, 4.	Noes, 3.
Mr. Ormsby Gore.	Mr. Sclater Booth.
Mr. Gregory.	Mr. Bonham-Carter.
General Dunne.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Another Amendment proposed to the proposed Amendment, by leaving out the words "The Reports of the Shannon Commissioners give the strongest assurances that by means of the works proposed to be executed, the lands shall be freed from inundations, and may be tilled"—(*Mr. Sclater-Booth*).—Question put, That those words stand part of the proposed Amendment.—The Committee divided:

Ayes, 4.	Noes, 3.
Mr. Ormsby Gore.	Mr. Sclater-Booth.
Mr. Gregory.	Mr. Bonham-Carter.
General Dunne.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Another Amendment proposed to the proposed Amendment, by leaving out the words "That for the object of drainage, quite as much as for navigation, and in full reliance on the pledge that the works specified on the maps should be carried into full and complete execution, the counties submitted to be taxed, and have paid in full the amount at which they have been assessed"—(*Mr. Sclater-Booth*).—Question put, That those words stand part of the proposed Amendment:

Ayes, 5.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Agar-Ellis.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Original Question put, That the proposed words be added after the word "That," in paragraph 2.—The Committee divided:

Ayes, 5.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Agar-Ellis.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Paragraph,

Paragraph, as amended, *agreed to.*

Paragraph 3.—Amendments made.—Question put, That this paragraph, as amended, stand part of the proposed Report.—The Committee divided:

Ayes, 5.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Agar-Ellis.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Paragraph 4, *disagreed to.*

Paragraph 5.—Question put, That this paragraph stand part of the proposed Report:—The Committee divided:

Ayes, 5.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Agar-Ellis.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Paragraph 6, *agreed to.*

Paragraph 7, *disagreed to.*

Amendment proposed, after paragraph 6, to insert the following paragraph: "That the Legislature, as well as successive Governments, having proposed to confine the waters of the Shannon and prevent the inundations, and to carry into full execution the completion of the works necessary for that purpose, your Committee are of opinion that the Government is bound to carry out the engagements on the faith of which the counties have taxed themselves, and have paid in full their obligations. It has been shown by the Government valuators, Messrs. Brassington & Gale, that 24,000 acres on the Shannon, and it has also been stated that 72,000 acres on the Suck, are every year more or less injured by floods. Your Committee consider that an Act of Parliament should be passed providing for the execution of the works necessary to prevent inundations by summer and autumn floods, and for levying off the lands to be improved a sum equivalent to the increase on the annual letting value of the lands to be caused by this drainage"—(Mr. *Gregory*)—Question put, That this paragraph be inserted in the proposed Report.—The Committee divided:

Ayes, 5.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Agar-Ellis.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Amendment proposed, after the last paragraph to insert the following paragraph: "That, although from the terms of reference your Committee has been precluded from investigating into the value of the Shannon navigation, yet, as the navigation and drainage are necessarily combined, they have incidentally received evidence that there is no passenger traffic either on the Upper or Lower Shannon, that the goods traffic on the Upper Shannon is merely nominal, and that, owing to the formation of railroads competing with water carriage, the same traffic on the Lower Shannon has become comparatively insignificant. It has also been stated that the chief cause of ordinary inundations is the fact that the Board of Works maintain, during the greater part of every year, several feet greater depth of water than is wanted by the present steamers or warranted by Act of Parliament; and your Committee are of opinion that, though the navigation should be maintained, it is inexpedient that a depth of water should be required which was not originally laid down in the Parliamentary plans, and which is totally at variance with that which is found sufficient for the navigation of other rivers and lakes in foreign countries"—(Mr. *Gregory*)—Question put, That this paragraph be inserted in the proposed Report.—The Committee divided:

Ayes, 5.	Noes, 4.
Mr. Ormsby Gore.	Mr. Acland.
Mr. Gregory.	Mr. Sclater-Booth.
General Dunne.	Mr. Bonham-Carter.
Mr. Agar-Ellis.	Sir Graham Montgomery.
Mr. Pollard-Urquhart.	

Remaining paragraphs, by leave, *withdrawn.*

Amendment proposed, at the end of the proposed Report, To add the following paragraph: "Your Committee have had before them the plans of Mr. Bateman and Mr. Lynam, for improving the drainage of the Shannon, and while they are not prepared to pronounce an opinion upon disputed points of engineering science, are nevertheless of opinion that experiments which can be effected at a small outlay should at once be proceeded with at Killaloe, for the purpose of ascertaining how the sluices proposed by Mr. Bateman, Mr. Lynam, and Mr. Forsyth, would act on the navigation and the drainage of that portion of the river between Killaloe and Meelick, which is the best pattern of sluice, and what improvements could be made upon it"—(Mr. *Gregory*).—Question, That this paragraph be added to the proposed Report—put, and *negatived.*

Another Paragraph added.

Question, That this Report, as amended, be the Report of the Committee to the House—put, and *agreed to.*

A letter from Mr. Penny and a letter from Mr. Kelly were severally read, and ordered to be inserted in the Appendix.

Ordered, To Report, together with the Minutes of Evidence and Appendix.

EXPENSES OF WITNESSES.

NAME OF WITNESS.	Profession or Condition.	From whence Summoned.	Number of Days Absent from Home, under Orders of Committee.	Expenses of Journey to London and Back.	Allowance during Absence from Home.	TOTAL Expenses Allowed to Witness.
				£. s. d.	£. s. d.	£. s. d.
James Lynam - -	Civil Engineer -	Ballinasloe, Ireland -	9	6 17 –	28 7 –	35 4 –
John Kelly - -	Civil Engineer -	Roscommon - -	12	6 10 –	37 16 –	44 6 –
				TOTAL - - - £.		79 10 –

MINUTES OF EVIDENCE.

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MINUTES OF EVIDENCE.

Thursday, 30th April 1868.

MEMBERS PRESENT:

Mr. Acland.
Mr. Agar-Ellis.
Mr. Bonham-Carter.
Colonel French.
Mr. Gregory.
Mr. Wm. Ormsby Gore.
Sir Graham Montgomery.
Mr. Pollard-Urquhart.
Mr. Sclater-Booth.
Colonel Vandeleur.

COLONEL FRENCH, IN THE CHAIR.

Colonel McKERLIE, called in; and Examined.

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1. You are a Civil Engineer?—No; I am a retired Officer of the Royal Engineers.

2. You are Chairman of the Board of Works in Ireland?—I am.

3. [*Mr. Sclater-Booth.*] I understand you have considered the statements made before this Committee, and are acquainted generally with the subject-matter of the inquiry?—I am.

4. Are you prepared to give evidence as to the view which the Board of Works takes of those questions?—I have it in print.

5. Then I must ask you to read it?—(*The same was read, and delivered in*:—)

"MEMORANDA relative to the WORKS of IMPROVEMENT in the NAVIGATION of the SHANNON, as carried out under the Acts 5 & 6 William 4th, c. 67, and 2 & 3 Vict., c. 61, with reference to the Statements which have recently been put forward in regard thereto.

"THE great question which has been raised, and which is at issue, is, whether the Commissioners appointed under the latter of the above-mentioned Acts to carry into execution the works directed to be designed and submitted to Parliament under the former Act, failed to fulfil the intentions of the Legislature, and to accomplish the objects desired to be attained, and for the benefits to be derived from which the several counties adjoining the river were made liable, and have contributed a moiety of the cost; and also whether any interest, especially that of the proprietors of the lands subject to inundation, has been injuriously affected, or has not received that advantage to which it was justly entitled.

"The following outline will explain the general facts and bearings of the case:—

"For the improvement of the navigation of the Shannon, during the last century, various efforts appear to have been made by the appointment of local or county Commissions and other means, under enactments of the Irish Parliament, but, from the want, apparently, of any general comprehensive plan, and the desultory manner in which the works were proceeded with, the results proved most unsatisfactory.

"In none of these earlier proceedings does it appear that the subject of the drainage of the lands liable to inundation by the floods of the river had received attention, or was looked on as a matter of moment, nor was it prominently brought forward until the year 1820, when a memorial was presented to the Irish Government by the late Earl of Clancarty and the present Marquis (then Earl) of Clanricarde, in which, though coupled with the improvement of the navigation, the drainage of the lands was the main object had in view, and on which a survey and inquiry was ordered to be undertaken by the late Mr. Rennie, who, on his part, confided the task to the late Captain Grantham, who (Mr. Rennie having in the meantime died) presented his Report in 1822.

"Subsequently, in 1831, a report from a committee of gentlemen interested in the same objects, and presided over by the Marquis of Devonshire, was submitted to the Government, and in consequence of these, and probably other representations, the Right Honourable E. G. Stanley (now Lord Derby), then Chief Secretary for Ireland, addressed a letter, dated 18 October 1831, to Colonel Burgoyne (now Field Marshal Sir J. F. Burgoyne), then Chief Commissioner of the Irish Board of Works (about that time being formed), calling his attention to the subject, and instructing him to undertake inquiries which 'should take within their scope the beneficial results which might be expected from a judicious expenditure of capital on the River Shannon, both with reference to the improvement of its naviga-

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tion, and also to the reclaiming of vast tracts of land now inundated periodically by the floods of that river and its tributary streams or rendered permanently incapable of cultivation from the accumulation of waters which are unable to find a vent;' and associating with him, as a commission for that purpose, Mr. T. Rhodes, C.E., and Commander Mudge, R.N. The instructions also further specially alluded, under the third head, to the subject of drainage, and desired that he would report his opinion 'of the practicability, expediency, and probable expense of removing any or all of these (referring to obstructions). and of the effect which such removal would have upon the general level and navigation of the river.'

"The memorandum drawn up by Colonel Burgoyne for the guidance of Mr. Rhodes, to whom the duty of inquiring into the condition and means of improving the upper or purely fresh water portion of the water was allotted, and which alone involved the question of drainage—the lower or tidal portion being entrusted to Captain Mudge—fully embodied the views expressed in the instructions; and in the reports and plans prepared by that gentleman and submitted by Colonel Burgoyne together with his own observations, the first series, in May 1832, to the Right Honourable Mr. Stanley, and the second, in April 1833, to Sir John Cam Hobhouse, who had replaced Mr. Stanley as Chief Secretary for Ireland, the special objects desired to be attained were duly kept in view and provided for.

"Following on this last inquiry a further investigation into the condition and circumstances of the Shannon was held by a Select Committee of the House of Commons in July 1834. In that investigation, however, neither in the examination of witnesses, nor in the Report of the Committee, was the question of drainage touched on, the object being solely to ascertain the state of the navigation and the best means of improving it; and in concluding their Report the Committee expressed their desire that the further steps necessary to admit of legislation requisite to give effect to their recommendations should be taken by the Irish Government with as little delay as possible.

"These recommendations were followed in the ensuing Session of Parliament (1835) by the passing of the Act 5 & 6 Wm. 4, cap. 67, intituled, 'An Act for the Improvement of the Navigation of the River Shannon.'

"In that Act the question of drainage is referred to only in the 4th section, and there apparently as a consequence merely of the necessity of confining the water to the natural bed of the river for the purpose of improving the navigation, while in the 8th section it is provided that any lands deriving benefit from their being thus relieved from inundation shall be liable to be charged with an amount proportionate to such benefit.

"The object of the Act was, as stated in the Preamble, to ascertain the most judicious, effectual, and economical manner in which the navigation of the river could be improved; and authority was given to the Treasury to appoint a Commission for the purpose, whose reports, plans, and estimates, should, when completed, be submitted to Parliament.

"The Commissioners who were accordingly appointed, namely, Colonel J. F. Burgoyne, R.E., Captain Jones, R.E., Richard Griffith, Esq., C.E., W. Cubitt, Esq., C.E., T. Rhodes, Esq. C.E., at once proceeded with their inquiries, and in a series of five Reports, the last of which is dated February 1839, accompanied by numerous general and detailed plans, with descriptions and estimates, set forth the measures which they recommended for adoption. The main points which may here be noticed are, that while the Commissioners considered the improvement of the navigation, as required by the Act under which they were proceeding, to be the great and important object to be attained, yet they recognized the desirability of confining the waters of the river at all times to its natural channel, not only on account of the advantage to the navigation, but also of the benefit which would accrue to the inundated lands from the facility for drainage which would be afforded, and this latter object is kept in view and referred to throughout the Reports. Yet it is to be observed that in their second Report, page 19, they express their opinion of the impracticability of imposing any special charge for the benefit so accruing to the relieved lands as contemplated under the Act, and recommend that it should not be attempted.

"The whole cost of the works of improvement they estimated at 584,805 *l.*, of which 52,137 *l.* was proposed to be expended in providing piers and landing-places on the Lower Shannon. It was recommended that the proprietors directly benefitted by their construction and the county of Clare should contribute 27,759 *l.* of that amount; while of the remaining sum, viz., 532,668 *l.*, it was submitted that the public and the counties bordering the river should contribute equal moieties; the proportions as regards the latter, as set forth in the fourth Report, having been determined on the principles laid down in the 8th section of the Act.

"The several reports, plans, and estimates were then, without loss of time, laid before Parliament, and having received its sanction and approval, the Act 2 & 3 Vict., cap. 61, was passed (17th August 1839), authorising and directing 'that the several words therein mentioned and described should be carried into full and complete execution, subject, however, to such alterations, additions, or reductions as shall be made therein pursuant to the power hereinafter reserved.'

"In that again which is entitled 'An Act for the Improvement of the navigation of the River Shannon,' the only references to the subject of drainage are in the 38th and 42nd sections, in each of which the words used are 'or to the drainage to be effected under this Act,' the extent and character, as well as the manner in which the benefit to be conferred by such drainage being that, of course, which was so repeatedly referred to in the Reports.

"The works were at once proceeded with under the direction of a Commission appointed by the Treasury under the authority of the 2nd section of the Act, the first Commissioners being Colonel Burgoyne and Colonel H. D. Jones and Mr. Griffith, and they were uninterruptedly continued until 1850, when the eleventh and final Report of the Commissioners was submitted to the Treasury and presented to Parliament, in which it was stated 'that the numerous works recommended in our several Reports already alluded to, which contained the detailed plans, sections, and estimates for such work, have been effectively

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effectively carried out as far as contingent circumstances would permit, no important variations having been made in any without the special sanction of your Lordships;' and in conformity with the requirement of the 73rd section of the Act, and the intention declared by the Commissioners in their Tenth Report, the works were handed over to the charge of the Commissioners of Public Works for future maintenance and control.

" In the earlier years after the completion of the works, but little complaint was made of their results, except in some few isolated cases, particularly in the neighbourhood of Banagher on the Middle, and Drumsna on the Upper Shannon, where it was stated that the expectations held out in regard to drainage had not been realized, and that the low lands were still subject to injurious flooding, if not even to a greater extent than formerly. These complaints became general in 1860 and 1861, arising from the unprecedented fall of rain and consequent floods which occurred in the summer and autumn of those years, and numerous memorials and representations were then put forward, resulting in the inquiries which, under instructions from the Treasury, dated 16th July 1862, were undertaken by Mr. J. F. Bateman, C.E., whose Report was presented to Parliament, and ordered to be printed in May 1863; the letter of Mr. F. Peel, Secretary to the Treasury, dated 3rd April 1865, expressing their Lordships' views and opinions on the points raised; the investigation before a Select Committee of the House of Lords in May 1865, leading to the renewed survey and inquiries directed to be undertaken by Messrs. Bateman and Lynam, whose reports, separately drawn up, and proposing very different measures, have been presented to Parliament; and also to the inquiry before the Select Committee of the House of Commons, which commenced in 1865, and by adjournment is yet in progress.

" The allegations on which those complaints have been founded, are that the works of improvement were not carried out in accordance with the plans submitted to, and approved and sanctioned by, Parliament; that the levels at which it was intended the waters should be maintained, as well as the general plans for the works, have been deviated from in a very prejudicial manner without authority; that the works have been left in an incomplete state; that the funds provided by Parliament had been misapplied, and that in consequence the drainage of the low lands subject to being inundated, and which it is alleged was provided and guaranteed under the Acts authorising the works, and was deemed to be of scarcely secondary importance to the navigation itself, has not only not been accomplished, but that even in some instances the lands have been placed in a worse position, as regards drainage, than before the works were undertaken.

" The following observations are made with a view to showing how far these allegations are borne out by facts:—

" In regard to alleged deviations from the prescribed levels, in one instance only, namely, that at Killaloe—where the water is held up in the reach above, embracing Lough Derg, 9 inches higher than was intended, in consequence of the weir wall having been raised that amount—does this occur; and there the reason which actuated the Commissioners was the same as that which in all other cases of deviation mainly guided and controlled them, namely, the ascertained impossibility of executing the works as designed for the amount provided, and the necessity for keeping the expenditure within that amount.

" At Killaloe, as at all other important points, the works were carried out under contract; and the amount at which it was ascertained their execution could be undertaken on that system on open tender (which was that which Parliament desired should be adopted) formed not only the guide as to what it was there (Killaloe) possible to effect, and what modifications it was necessary to introduce to bring the cost within the estimate, but also showed how far it was necessary to reduce the outlay in the same reach above by diminishing the excavation through keeping up the water level as stated.

" The deviation in the plans of the works, as executed from the approved designs, was principally in narrowing in some places the width of the sailing course; in adopting the main river channel, instead of making new side cuts, or improving old lateral canals for the navigation; and in erecting new, instead of underpinning and repairing old, bridges. The first of these deviations was attributable solely to cost; the second had the additional reason that the river course was on a general principle considered better adapted for improved steam navigation than the narrow waters of canals; and the third, the bridges, it was found a matter of necessity to rebuild, the state of their foundations being found to be such as to render underpinning extremely dangerous, if not impracticable.

" In several of these cases of deviation it will be found in the Annual Reports of the Commissioners, that they were specially brought under the notice of the Treasury and duly sanctioned; in others, as at Athlone, the actual record of the authority to deviate has been found, though not mentioned in the reports; in another which has been brought forward, namely, at Cloondrah, where the keeping to the river for the purpose of navigation was adopted in preference to a lateral cut as shown in the plans, the option to do so was specially left open to the discretion of the Commissioners in the printed explanation of the design, and in every case it is not too much to ask that the recorded statement of such men as the late Sir H. D. Jones and Sir R. Griffith, as given in the 5th page of their 11th and final Report, that 'no important deviations had been made in any work without the special sanction of their Lordships'—should be accepted as entirely conclusive against the doubts and assertions which have been put forward by persons who can have nothing but supposition to support them.

" With regard to the alleged incompleteness of the works in certain parts, as already adverted to, and notably in the locality immediately above Meelick, the channel of the river, and its consequent capacity for discharging flood-water, was not enlarged to the full extent originally contemplated, for the reasons which have elsewhere previously been given; but in the case of the unimportant canal between Battle Bridge, on the Shannon, and Lough Allen (an old work which it was proposed to improve), alone can it be said that the works were left in such a state as not adequately to meet the intentions set forth in the plans and explanatory reports submitted to Parliament. What was therein proposed was certainly not carried out, no doubt owing to the combined consideration of the ex-

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hausted state of the funds available, and the comparatively very small amount of the traffic which it was designed to accommodate.

"The erection of new in lieu of old bridges, which it had been proposed only to repair and underpin, has also been made the subject of objection as diverting from its legitimate purpose a portion of the funds provided. It has already been stated that this was unavoidable, from the condition in which they were found; but it may here be remarked, in reference to a statement made by Mr. Long, in his evidence before the Select Committee of the House of Commons in July 1865, that from 20,000 *l.* to 25,000 *l.* had been thus misappropriated, that the whole cost of the four bridges rebuilt was only 13,481 *l.*, while the sum provided for the repair was 9,431 *l.*, leaving about 5,050 *l.* only as the excess of cost on these bridges. And when it is considered that a sum of 25,000 *l.*, which had been provided for works on the Shannon, below Limerick, but was not expended in consequence of the required local contributions not being forthcoming, was authorised by the Treasury to be appropriated to the works on the upper river, there is but little ground for the exception taken, even after deducting therefrom the amount of the defalcation, viz., 7,876 *l.*, by the Assistant Accountant, to meeting which loss an equivalent portion of that sum was applied.

"With reference to the question of the drainage of the lowlands, and the alleged non-fulfilment of the undertaking entered into by the Government in that respect, it appears, though, no doubt, always considered as a desirable object to be attained, and in the earlier correspondence in regard to the improvement of the river a matter of very prominent importance, that in the Acts authorising the inquiry and the execution of the works, as well as the inquiry before the Committee in 1834, the primary object was unquestionably the perfecting of the navigation, while the advantages to be derived from drainage were merely regarded as consequential on the confining of the waters for the purposes of navigation to the natural channel of the river; and, looking to the vast benefits which were anticipated, to a wide extent of the country, from the opening up of a great highway for the export of its produce, and the import of foreign commodities, it can scarcely be supposed that the questionable improvement (for questionable, at that time, it certainly was, as appears by the Commissioners' reports*) of about 32,000 acres could be put in comparison with it. At the same time, moreover, it was provided that any benefit which might be conferred on particular lands in consequence of relief from flood water should contribute a proportionate amount to the general cost. But in no case was any such charge imposed, for the reasons stated by the Commissioners, though undoubted benefit was in many cases conferred, and land permanently relieved to the extent (as since ascertained by special survey) of 12,000 acres; and it is difficult to understand on what ground, under these circumstances, the proprietors now claim the right to have had their lands completely drained and improved by the works, seeing that they were called on to contribute to the cost solely for the benefit supposed to be derived from navigation, and in the same proportions as the ratepayers who had no land within many miles of the river.

"In some cases, however, it has been represented by witnesses before the Committees of both Houses that the lands of proprietors have been placed in a worse condition by the works, or rendered more subject to floods than they were before their execution.

"The accompanying tables (*vide* Appendix), which have been prepared with much care for the purpose, will show how entirely without foundation these statements are. Taking, for example, from them the two worst cases, viz., that at and above Meelick, and in the reach above Rooskey, the tables relative to the former show that the average number of days on which the floods are now out annually over the Callows, as compared with the time before the works were executed, is as 95·6 to 147·6; and for the four summer months during which they are liable to the greatest injury, the numbers are as 1·2 to 1·5; the years of unprecedented rainfall, 1860 and 1861, including almost the whole amount in the first term of the latter proportion, and taking the tables referring to Rooskey, it will be seen that the average annual number of days of flood now and formerly, are as 45 to 170, and for the summer months 0·1 to 4·6.

"Objections have been taken to averages, but in whatever way the tables are taken, the result will be the same, and though it may be shown in one particular instance, that of the winter of 1852, the floods rose to a higher level than on any previous occasion, either before or subsequent to the works being executed, all that is to be said is, that had that extraordinary flood occurred before the works were done, it would have risen to a still greater and more destructive height.

"A comparison of the general maximum heights to which the flood waters have risen since the completion of the works, with those they formerly attained, will show the ground on which this assertion is made, and the same reference will further show how comparatively few even such diminished floods have been.

"The Board of Public Works, as the representatives of the Shannon Commissioners, are quite prepared by competent witnesses to prove all the facts herein stated, both as regards the works, their deviations, their causes and effects, and also their results in regulating the waters of the river, and the benefits they have actually conferred; and in claiming here, in conclusion, attention to the high encomium passed with respect to the works as a whole by the distinguished engineer, Mr. Bateman (*see* page 5 of his report), it may further be remarked that the Shannon works afford a rare instance of an undertaking of so vast an extent being carried out, in an element so difficult to contend with, so near to perfect completion for the sum estimated."

"*J. G. M'Kerlie.*"

"30 April 1868."

6. *Chairman.*]

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* It has been sought to be maintained that it was the intention of the Legislature that the water of the Shannon should not be allowed, after the due completion of the works, to rise above the line marked on the section, "Proposed permanent level of water," but no one with the smallest knowledge of the principles of hydraulics could for a moment, especially in long reaches of river course, contemplate the possibility of such a state of things. It is, besides, distinctly stated in Mr. Rhodes' preliminary report, as well as adverted to in Sir J. Burgoyne's letters referring thereto, that a rise of water ranging according to circumstances from 1 foot 6 inches to 2 feet 6 inches was to be calculated on as unavoidable in time of floods.

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6. *Chairman.*] This is put in as the whole defence of the Board of Works, who admit themselves to be the representatives of the Shannon Commission?—It is a defence.

7. I suppose there is nothing left out, because there is a good deal put in there that is quite contrary to the evidence; and as for the opinions of the Board of Works, they would have to be substantiated by evidence where we contradicted them. I wanted to know whether there was anything more to come from the Board of Works.

8. Mr. *Sclater-Booth.*] You have given this evidence in your position as Chairman of the Board of Works?—I have.

9. And this is your view generally of the question as it now presents itself to the Committee?—It is.

10. You have an engineer more conversant than yourself, I suppose, with the practical details of the works, Mr. Forsyth?—We have.

11. And he is ready, I understand, to be examined on matters of detail?—Yes.

12. And your valuator, Mr. Penny, is also ready to be examined?—He is.

13. He has recently been down the river and proved the levels, and is prepared to enter more into detail on the subject-matter, should the Committee desire to examine him?—He is.

14. In presenting this statement to the Committee, I presume that the Board of Works have no wish to express any opinion as to the propriety of works of drainage being carried into effect or not?—Certainly not.

15. At all events so far as they are concerned, it is not their business, nor do they wish to place any hindrance in the way of such works being executed?—None whatever.

16. Except so far as they might interfere with the navigation, which it is the duty of the Board of Works to maintain?—Quite so.

17. But in the event of any works of drainage being hereafter authorised, have you any opinion as to whether they should be of an exceptional character as regards particular districts, or of a comprehensive character as regards the whole river; does that affect your position as conservators of the navigation?—I think it is necessary that whatever works are carried out should extend throughout the whole river.

18. As trustees of the navigation, you feel no jealousy as regards the improvement of the adjoining lands?—None whatever; we should be happy to see it carried out.

19. At the same time, have you any opinion that you can give us as to the amount which, under ordinary circumstances, the owners of adjoining lands could be expected to contribute towards the execution of any such works?—The amount which it has been ascertained the proprietors can be called upon to contribute annually for the benefit they would receive, if complete works of relief were carried out, would be about 6,000 *l.*

20. Mr. *Pollard-Urquhart.*] Six thousand pounds a-year?—Yes, annually; and capitalising that, on the principles of the Lands Improvement, the whole sum which would be repaid in respect of that improvement would amount to about 90,000 *l.*

21. Mr. *Ormsby Gore.*] That is paying off the capital and interest in 22 years?—The amount of capital which would be repaid would be about 90,000 *l.*

22. In fact, that sum would be discharged at the end of 22 years?—Yes.

23. Mr. *Pollard-Urquhart.*] By a terminable annuity of 6,000 *l.* a-year?—Yes.

24. Mr. *Bonham-Carter.*] When you say the drainage should extend to the whole river, do you mean to say that it ought to be taken as a connected whole?—Yes, for two reasons. I think there is no part of the river upon which the proprietors have a better claim than upon another part to have their land improved; and I also think it is absolutely necessary that any works of improvement should be commenced at the foot of the river and carried up throughout.

25. And that, in fact, great outfalls will have an influence nearly the whole of the way up the river?—The outfall for any improvement in higher parts of the river must be carried the whole way down.

26. Will you allow me to ask one further question of you; you say the whole river, do you mean only the Shannon, or the Shannon and its tributaries?—Solely the Shannon.

27. Any works for the drainage of the Shannon would only incidentally affect the tributaries?—They would only incidentally affect them; any works on the Shannon which contemplated the giving an opportunity of improving the tributaries ought to be enlarged with that view.

28. Mr. *Ormsby Gore.*] Will you repeat that answer?—Any works undertaken on the Shannon in which it was contemplated that the power of relief or improvement should be extended to the tributaries should be correspondingly increased.

29. Mr. *Bonham-Carter.*] Then I understand you to say that complete works of relief (that is to say what you say would be complete, because you remember the question of what "complete" means has been constantly arising) would be complete relief to the land in the basin of the Shannon itself, and not the tributaries?—I confine the term "complete relief" to the lands bordering on the Shannon and immediately subject to its influences.

30. Mr. *Gregory.*] Would it not contribute indirectly to the relief of the tributaries; a good deal of water is thrown back upon the tributaries by the overflow of the Shannon?—Any additional works would unquestionably assist in affording an outfall and means of relieving these tributaries, but it would be necessary to carry out further works to admit of the tributaries being opened up without injuriously affecting the main river.

31. On the Shannon as well as on the tributaries?—Yes.

32. Mr. *Sclater-Booth.*] In saying all this, you speak in the interest of the navigation of the river as a whole?—I do.

33. That is how I understand your first answer to me, that, speaking in the interests of the navigation of the river, you could not view with favour any works on the upper part of the Shannon as to which there was not an arrangement made to carry the extra water brought into the basin of the Shannon right down to the sea?—Yes; I confined my observation to the Shannon alone, and did not include the tributaries.

34. Mr. *Ormsby Gore.*] As bearing upon that subject, will you allow me to ask you why the effect of arterial drainage on the floods of the Shannon has not been taken into consideration in this

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this memorandum of yours?—The question did not arise, I think, in making those observations.

35. A great many of the witnesses have spoken upon the subject of the floods being increased by the arterial drainage that has been going on on many of the contributories of the Shannon, and it seems rather strange that there should be no paragraph in your memorandum alluding to it even in the most cursory manner?—I allude in the memorandum to the river as it is, and to the state it was in before the works were done. The arterial drainage works have all been carried out, or the greater portion of them, since the works were completed, and whatever effects they may have produced upon the river has been in action for the last 10 years.

36. Has not the arterial drainage been one main cause of the additional flooding of the Shannon?—I do not admit that there is any additional flooding in the Shannon. I have endeavoured to make it apparent that the floods in the Shannon have been very much diminished.

37. Since the works were effected?—By the execution of the works.

38. But since those works were completed on the Shannon, arterial drainage of tributaries has taken place?—To some extent it has.

39. And is it not self-evident that that drainage must bring the water down into the bed of the Shannon much quicker, and thereby create more rapid floods?—There is nothing whatever in the records to show that the completion of the arterial drainage has added to the floods in the river.

40. Is it not self-evident?—I think not.

41. You say that it is not self-evident that additional drainage coming into the Shannon would naturally quicken the rise of the floods; if the outfall is not increased, and the influx is increased, will it not be self-evident that a flood must rise?—I said that there is no evidence whatever to show us that the floods have been increased in the Shannon by reason of the arterial drainage works which have been carried out; and I say so because in the upper part of the Shannon above James Town, which is one of the parts more particularly complained of as having been not relieved, and in fact as having been injured by the Shannon Improvement Works, no arterial drainage works whatever were carried out except in the drainage of Lough Gara, the effect of which was unquestionably to diminish the discharge into the river.

42. Do you not mistake in saying above James Town; do you not mean above Ruskey?—No, I say above James Town.

43. Because we have it in evidence that the reach between James Town and Ruskey is worse than it was, in consequence of a weir at James Town discharging the waters quicker than they could be discharged from the weir next below, which is at Ruskey?—I alluded to James Town as being above Ruskey, and I said that no arterial drainage work had been carried out above James Town which could possibly injuriously affect the floods; on the contrary, what had been done in that way diminished them.

44. I believe it is admitted that there has been an improvement about James Town at the expense of the reach next below it?—Well, I do not admit that. I do not admit, on the part of the Board of Works, that anything done at James Town has been at the expense of the reach below. There is an arterial drainage district between James Town and Ruskey, the Strokestown district, which discharges into that reach.

45. There is also a small river called the Eslin?—Yes; that is a very small affair; but I was alluding, in the first instance, to the evidence on the reach I mentioned as being contradictory to the assertion that arterial drainage unavoidably increased the floods. There are other districts below Ruskey into which other arterial drainages discharge; but there is nothing, as I said before, to show, from the records, that the floods in the river have been increased by those drainage districts, because the floods previous to the completion of those arterial drainage districts were greater than they have been since their completion.

46. Has the outfall of the Shannon been in any way improved since the commencement of the arterial drainage?—No, it has not. A considerable number of the arterial drainage districts were being carried out simultaneously with the improvement of the Shannon, but very few of them were completed before the works of the Shannon. Most of them were completed a good many years subsequently to the completion of the Shannon works; and, as I said before, there is nothing to show that the discharge into the river, or rather that the floods in the river have been increased by the opening up of the arterial drainage districts.

47. Practice is a very good thing, and so is theory; will you allow me to ask, has not the Brosna been improved?—It has.

48. Has not the Inny been improved?—It has.

49. Has not the Fallon been improved?—Yes, but it is a very small district.

50. Has not the Camlin been improved?—It has.

51. The Rinn?—Yes, and the Black River.

52. The Eslin?—Yes.

53. The Strokestown River?—The Strokestown River also.

54. Can you state any other river that has been improved?—There is the one I first mentioned, the Lough Gara, and there are several below. There are several other districts below Athlone discharging into Lough Derg.

55. Does not all that tend to raise the floods?—I have said that there is nothing in the records to show that they do, but the contrary.

56. Is it not necessary, in all these cases of arterial drainage, that the sanction of the Board of Works should be obtained before the works can be commenced?—They were all carried out under the Board of Works, all the former arterial drainages, which discharge into the Shannon.

57. Have the Board of Works the power to withhold their assent to any works of arterial drainage?—Yes, they have.

58. Under the Act of Parliament?—Yes.

59. Even though three-fourths of the proprietors may approve of them?—Yes.

60. Did it ever suggest itself to the Board of Works to withhold their assent, when three-fourths of the proprietors had agreed together?—In two or three cases recently we have recommended the proprietors, though they did assent, not to proceed with the works, because they would not be remunerative

61. But never upon the ground that they would increase the floods in the Shannon?—No.

62. You never thought that bringing the water down from one district into another, and not discharging

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charging it any quicker would be upon the principle of robbing Peter to pay Paul?—The question has never come before us, upon any direct application. We have expressed an opinion in regard to the Suck, that we do not think we would be justified in giving our assent to its being opened up and being discharged into the Shannon unless additional works were carried out.

63. That is the only case?—That is the only case.

64. You are Commissioners for the Shannon? —We are.

65. Is there any officer in the Commission of the Shannon whose duty it is to see what would be the effect of an arterial drainage upon the navigation?—No; we consider all those questions as a Board. I would beg to be allowed to explain, with regard to arterial drainage, that I do not deny that floods are brought down quicker by the carrying out of arterial drainage works; but every case must have its own peculiar features. In some instances, no doubt, and in mountainous districts, the floods are much more rapidly discharged when water courses are opened up; in flat districts less so, but still there are other circumstances which materially affect the influence upon a great river like the Shannon. One is, that for the most part when the rains occur, it will be found that one river will have discharged its flood before another is brought into action.

66. Are there any applications now before the Board of Works for arterial drainage, to be carried out upon any of the tributaries to the Shannon? —We have about 14 districts now in progress, but none into the Shannon.

67. No new works have been applied for?—Yes, all over Ireland, but none into the Shannon.

68. Mr. *Pollard-Urquhart.*] What do you say to the Inny?—That will be ultimately discharged into the Shannon.

69. Mr. *Ormsby Gore.*] Has that been applied for?—It has.

70. Is there not a river that runs from Elphin that they propose to drain?—Yes.

71. Is that before the Board of Works?—Yes, I had forgotten that.

72. Do you think the Board of Works will be justified in constructing these works?—Yes, I think so.

73. Without improving the outfall of the main river?—Yes, I think so.

74. Mr. *Bonham-Carter.*] I think I understood you to say that by the arterial drainage, although the discharge from a given river is quicker over a large area, the rainfall is not necessarily discharged as a whole more rapidly?—Yes.

75. That the successive tributaries from the nature of rainfall floods generally, probably discharge at a different rate, so that on the whole the flood at the lower end of the main river is not necessarily larger?—That is what I meant to convey.

76. Mr. *Ormsby Gore.*] A former witness, a civil engineer, is asked this question, "Was any "part of this increased flood owing to the greater "drainage that has taken place in other parts of "the river?—*A.* As to that part below Killaloe, "it may be so. *Q.* Are you aware whether there "is any part where the volume of water is increased by the drainage?—*A.* Yes, I know "where several tributary rivers have been drained, "and discharge more rapidly into the Shannon." Do you agree that these rivers are drained more rapidly into the Shannon?—Yes.

77. And do you agree that the discharge from the Shannon is no more rapid than it was?—Yes.

78. I mean than it was since the completion of the works on the Shannon?—What I stated was, that previous to the completion of the arterial drainage works the floods in the Shannon were greater than they were since the completion of those arterial drainage works, and therefore the inference I draw is, that their completion has not injuriously affected the floods in the Shannon and caused them to be greater.

79. Has not prejudicially affected them?—It has not.

80. Sir *Graham Montgomery.*] You can prove that from your tables of the height of the flood waters before the completion of the works and afterwards?—Yes; the table will show the precise state of the river in each year as regards its water level, both in flood times and in ordinary times.

81. Mr. *Pollard-Urquhart.*] With reference to the land adjoining the Shannon, have not the floods risen much higher since the Shannon works have been completed than before?—No; in no case.

82. In no case, even for any short time?—Not even for a short time, except in the year 1852. In the winter of 1852–53 there was a very extraordinary flood which I have adverted to in my paper in which I have stated the floods did on that occasion rise higher than upon any other occasion of which there is a record either before or since.

83. But do you mean to say that in the years 1861 and 1862, after these very rainy seasons, they did not rise higher than before?—No, they did not.

84. They rose higher after those floods than they had ever risen before?—No, they did not indeed; the records will show.

85. Mr. *Bonham-Carter.*] Have you any records which show in any degree what may be called the volume of the flood, in any of these great floods, where you had evidence from guages that in one year greater floods came down the river, whether they came fast or slow?—We have records which will enable calculations to be made as to the volume on the occasion of every flood.

86. So that the question whether the works have produced a certain effect is very materially affected by the nature of the flood which came down, whether it was in itself a heavy flood or a light one?—The amount of the water discharged must inevitably be dependent upon the amount of rainfall.

87. Those floods of 1861 and 1862 are called unprecedented?—They are.

88. Is there any evidence to show what proportion those floods bore to what may be considered the ordinary high floods of other years? —Yes, our tables will show the extraordinary flood, the ordinary high floods, and the floods generally throughout a long series of years, by which comparisons might at once be made; but there is also a published statement of the rainfall during a long series of years at various points over Ireland, which will show that there was no fall of rain at all to be compared with what occurred during those two seasons.

89. Then is not the inference that the works which were made in contemplation of floods which were in the experience of preceding years, must necessarily not be competent to meet such extra-

ordinary floods as those which occurred, and that the conclusions as to flood must be materially influenced by the magnitude of those particular floods?—The preparations were not designed to meet such extraordinary floods occurring in the summer season. The water way provided was quite adequate to confine the floods within the natural channel of the river at that season, and when those floods came out over the land in that period of the year when the crops are on the ground, and are liable to injury, of course a great amount of injury was sustained which was never calculated upon.

90. Do you believe that any works which were contemplated to the greatest extent in any of the recommendations or surveys could very materially have effected the injury to the lands in those particular floods?—I beg your pardon.

91. Supposing the works which were contemplated had been carried out to the fullest extent possible, (there being an allegation that they were not carried out) could the injury to the lands which certainly did happen in 1861 and 1862, at the time of those great floods have been prevented?—I think that had the works been carried out to the full extent contemplated, they would not have prevented, though they would have somewhat diminished, the extent of the flood which took place during those years.

92. Mr. *Pollard-Urquhart.*] They would have very considerably diminished what took place in those two years?—Yes, I think it would have been very considerably diminished.

93. Mr. *Gregory.*] If the works had been carried out as originally contemplated, would they not have prevented ordinary floods?—No; I do not think they would.

94. Small floods?—Small floods they would.

95. Mr. *Pollard-Urquhart.*] And diminished extraordinary?—Diminished ordinary.

96. I say diminished extraordinary?—And, of course, extraordinary.

97. Were you acquainted with Ireland during the years 1840 and 1841?—I was not.

98. Can you speak as to the amount of rainfall in those two years, in which there were what might be called almost extraordinary floods?—In Mr. Bateman's report the rainfall, as ascertained from records kept at various points in Ireland, is given for a long series of years, as far back as 1830.

99. *Chairman.*] They are given on an average estimate, are they not?—No; the actual rainfalls at various points over Ireland, at Belfast, Galway, and various other places is given in the table of rainfall in Mr. Bateman's report.

100. Mr. *Pollard-Urquhart.*] Do you recollect that the rainfall of 1840 and 1841 was nearly as high as that of 1861 and 1862?—No; it fell very materially short of it. There was nothing approaching to the rainfall of 1860 and 1861.

101. Mr. *Gregory.*] You have stated that, "during the last century various efforts appear to have been made by the appointment of local or county commissions, and other means." I presume that was in consequence of the recommendation of the inhabitants of the counties affected by the Shannon?—Yes; the facts which I there advert to were stated in evidence before the Select Committee in 1834, and it is from that I have taken the statement.

102. And I understand from this paper that in those cases the representations were made, with the view to improve the navigation of the Shannon?—Yes; the navigation.

103. That was the main object?—Yes.

104. Do you collect from those representations that were made that the inhabitants of these different counties proposed to tax themselves for the navigation of the Shannon, or that they required it to be done as a public work, and out of public funds?—I cannot say.

105. Are you aware of any proposal on the part of the proprietors of the adjacent lands, to tax themselves, as regards the Shannon, previous to the year 1820?—I am not.

106. The recommendation of the memorial that was presented to the Government in 1820, by the late Earl of Clancarty and the present Marquis of Clanricarde, contemplated, I think, that the proprietors benefited by the drainage of the Shannon should tax themselves?—I believe it did so.

107. The whole of the principle of that memorial rested, I think, upon the benefit that the proprietors should obtain by the drainage of the river?—I believe it was so.

108. Was not the navigation merely incidentally referred to in that memorial?—It was quite a secondary question.

109. And it was in consequence of that memorial in 1820 that the survey and the inquiry were ordered by the Government?—It was.

110. That survey was confided to the late Mr. Grantham, was it not?—To Mr. Rennie, who employed Mr. Grantham.

111. Have you read Mr. Grantham's report?—I have seen it; I looked over it some years ago.

112. Are you not aware that from the beginning to the end of that report the great object which Mr. Grantham contemplates is drainage and reclamation, and not navigation?—I do not remember his special views.

113. Are you aware that Mr. Grantham winds up his report by the following sentence:—"The improvement of the country in every respect by draining the Shannon, may, I believe, be considered unquestionable. It is only in the advantage to be derived from bringing large tracts of country, now of little value, into cultivation, improving the climate, making the navigation more perfect, and giving employment and new settlers to a widely extended district, that the real benefits to be obtained can be justly estimated?" Do you remember the passage?—No.

114. Of course you have read it, and I have given it correctly?—Certainly.

115. Therefore I think I may take it for granted, that the first steps taken by the Government were with a view to the drainage of the Shannon, rather than navigation?—The inquiry of 1820 undoubtedly was.

116. That inquiry took place in the year 1820, did it not?—The report was presented in 1822.

117. In the year 1831 the Government ordered a more full and minute survey of the river to be made under Colonel Burgoyne?—Yes.

118. Was not that for the double purpose of improving the navigation, and preventing the inundations?—It was.

119. Are you aware of the instructions that were issued by the Government of that time to Colonel Burgoyne by Mr. Stanley, now Lord Derby?—Yes.

120. Am I correct in saying that this was part of the instructions? "It is thought desirable by the Government, that your inquiry should take a wider

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wider range, and should take within their scope the benefits which might be expected to result from a judicious expenditure of capital upon the River Shannon, both with reference to the improvement of its navigation, and also to the reclaiming of vast tracts of land now inundated periodically by the floods of that river and its tributary streams, or rendered permanently incapable of cultivation from the accumulation of waters which are unable to find a vent." Am I correct in quoting that passage?—Yes, I also quoted it in the memorandum I submitted.

121. Then the Act of Parliament of 5 & 6 Will. 4, sect. 4, c. 67, ordered the Commissioners "to make out a plan and estimate, showing and describing the several works proper in their judgment for clearing and improving the same, and for confining the waters thereof and preventing the inundation of contiguous lands." Is this statement of yours correct, in which you say that in this Act, 5 & 6 Will. 4, the question of drainage is referred to only in the first section?—No, the draft of my memorandum has been inaccurately copied; it is not mentioned in the first section at all.

122. As you state that this paragraph of your memorandum is inaccurate, do you wish to make any correction in it?—I wish that the fourth section should be quoted instead of the first.

123. Will you not admit the necessity of a further correction, and consider that in that section there are words which extend further than merely to the necessity of confining the water to the natural bed of the river for the purpose of improving the navigation, the words being "for confining the waters thereof, and preventing the inundation of the contiguous lands"?—My opinion is, that the purpose for which it was there provided that the water should be confined was the improving of the navigation, and has reference more immediately to the navigation than to any improvement that the lands might derive from drainage.

124. Have you read this passage carefully, and does it not appear to you that there are, as it were, two divisions of the sentence: that "the said Commissioners for the execution of this Act shall, if necessary, make out a plan and estimate, with proper plans, maps, drawings, and sections, and elevations thereto attached, showing and describing the said navigation and the several works proper in their judgment to be executed, for the clearing and improving the same?" Does not that appear to you as if the question of navigation closed at the word "same," and that then the statement of the other object was begun, viz., "for confining the waters thereof, and preventing the inundation of the contiguous lands"?—It might be so understood, I think; but my interpretation of it was, that the waters were to be confined for the purpose of navigation primarily."

125. Mr. *Bonham-Carter.*] Do I understand you to mean that the navigation would be improved by the greater definition of the channel, by bringing the flood waters into the natural banks?—Yes, that is the opinion I formed on the subject.

126. And that the effect upon flooded lands in an agricultural point of view was not contemplated by the Act, except incidentally?—Quite so.

127. Mr. *Gregory.*] Have you the First Report?—Yes, I have seen this Report.

128. Does it in your opinion support the view, that the navigation throughout was the primary object, and that the allusion to flooded lands, where it was made at all, was incidental to the navigation?—Yes, I think it is not only in this First Report, but in the following Reports, clear that the principal object was the improving of the navigation; that, as a means of effecting that improvement, the confining of the waters to the natural bed of the river was a matter of great importance, and that the benefit to be derived by the land was merely consequential.

129. Have you read the fourth section of this Act in connection with the eighth section, and does it not appear to you that the double object which I read to you from the first section is clearly sought, improvement as regards navigation and improvement as regards drainage, and for this very reason, that if you look at the eighth section you will find that the Commissioners shall adjudicate upon the proportion of the expenses to be borne by the counties that are likely to derive benefit from the proposed work, that is, by their lands being relieved from inundation?—Yes; that section clearly contemplated benefit being conferred on the lands, and that they should be charged for that benefit in proportion.

130. Does it appear to you to result from comparing these two sections that, as I said before, there was a double object in view, navigation and drainage, and that the benefit the landowners were to obtain from the drainage was what was to be assessed upon them?—I have mentioned that throughout the whole series of their reports, their preliminary reports, the drainage of the lands was looked upon as a very important object to be attained by the Commissioners.

131. Are you not aware that in the other reports (I will not read the words of them), the reports in 1837 and the reports in 1838, improvements in drainage have also been expressly referred to as parts of the objects of the Commissioners?—Yes, I have stated that in the memorandum which I have submitted.

132. Do you think it is likely that the landowners of these adjacent countries would pray to be taxed merely to obtain a better navigation of the River Shannon?—It appears they did consent to be so taxed.

133. To be so taxed, certainly; but do you not think that at the time they consented to be so taxed they had a double object in view, viz., the improvement of their lands, and also the improvement of the navigation?—The proprietors at a distance beyond the reach of the floods could have had no object in consenting to be taxed for anything unconnected with the navigation.

134. You have referred to the deviations from the prescribed levels; I want to ask you in regard to the deviation at Killaloe; is that quite correct, that "the water is held up in the reach above, embracing Lough Derg, nine inches higher than was intended, in consequence of the weir wall having been raised that amount." Is it not more than nine inches?—No, it is rather less.

135. All across?—Not all across; it is 18 inches high at one end, diminishing to nine inches at 200 feet distance. In the remaining 900 feet it is somewhat variable, but it is somewhat under nine inches.

136. Do you not consider that that deviation was one of very considerable consequence as regards the whole of the principle of the work?—

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Not as regards navigation. I do not think it was of any consequence in that respect; but it certainly was of consequence as regarded the drainage of the lands.

137. Precisely; then do you think that if it was lowered nine inches, it would have a beneficial effect as regards the drainage of the lands?—It undoubtedly would.

138. And would not interfere with navigation?—Yes, it would interfere with navigation.

139. In what way would it interfere?—It would lower the water upon the lower sill of Victoria Lock to something under six feet. There should be six feet depth of water.

140. What is the draught of water for steamers?—I really do not know.

141. Do you think it is necessary to keep up the navigation to a depth of six feet?—It was a condition laid down in the plans; it was what was promised to the public, that there should be a six feet navigation. Circumstances have, no doubt, altered since the works were carried out; but still I apprehend that for the size of the navigation, the broad waters that have to be crossed by steamers, it would be very undesirable that the depth of water should be diminished.

142. Do you think that the benefit the country obtains from these steamers would be greater than the country would obtain from the drainage of the large number of acres now subject to inundation?—I think the benefit this country derives from the navigation, even such as it is, greater than any interest in the lands to be derived from their improvement.

143. You know the annual tonnage of goods carried?—It is not great; it is somewhere about 30,000 tons, but I do not recollect precisely.

144. Do the steamers take passengers?—Some of them.

145. Is there not a large amount of land adjacent to the tributaries of the Shannon which pay an annuity to the Board of Works for drainage?—Yes.

146. Colonel *Vandeleur*.] Mr. Gregory asked you about the Victoria Lock; is not the Victoria Lock nine inches higher than it ought to be according to the Parliamentary plan?—No, it is not.

147. Not the lower sill of Victoria Lock?—It is six inches higher.

148. You state that you had authority for the deviations in every case; were there any deviations at Meelick, and Counsellor's Ford?—I believe the Shannon Commissioners had authority for all important deviations as they state they had.

149. You are aware, I believe, that there were considerable deviations at Counsellor's Ford?—Only in regard to the width to which the channel was excavated. It was not carried out there to the full width contemplated; the depth was carried out fully.

150. That is the most important level of the river, I believe?—The reach above Counsellor's Ford is the most important on the Shannon.

151. Between Meelick and Athlone?—Yes.

152. The Suck and Brusna come in there?—They do.

153. There is a greater discharge there?—There is a greater discharge into it than in any other level.

154. From that level?—No; there is a greater discharge at Killaloe. The discharge increases as it goes down.

155. Mr. Bateman in his report lays great stress upon the opening of the old channel of the river at Counsellor's Ford and Bishop's Islands?—He proposes that as one of his remedial measures.

156. You are aware that the river there was not opened to anything like the extent that was intended by the Shannon Commissioners, and which the plans originally laid down indicate?—It was not opened to the full extent.

157. It is only, I believe, 250 feet wide?—Immediately above Meelick there was a projection of 40 feet which was not cut off; a projection of the river bank, which had been intended to be cut off, but was not so.

158. Do you know what is the difference in the level that Mr. Bateman states would be created if that opening was made?—I am not aware that he states what it would be.

159. Mr. Bateman, I think, states that if that opening was made, and the works carried out according to the plan suggested, there would be a difference of from two feet six inches to three feet in the flood waters?—I have no doubt there would be if the channel was opened up sufficiently to admit of the necessary discharge.

160. What amount of land would that clear?—I am unable to say.

161. Either Mr. Bateman or Mr. Lynam states, I think, that it would be about 16,000 acres?—The work referred to alone would not suffice; other works would be necessary further up the river. That alone would not accomplish the object.

162. Do you think, as Mr. Bateman says, that if the works had been carried out according to the plans originally laid down by the Commissioners, and the Parliamentary plans, the great floods would not have taken place?—I do not think that if the works had been carried out according to the plans, there would have been any very material difference. No doubt small floods, as I before said, would not have taken place, and there would have been a diminution in larger floods, but I do not think it would have been of any very great consequence.

163. Mr. Bateman states that if the old channels were re-opened as now proposed, and sluices introduced, very considerable relief to the reach above would be afforded; and he says that the floods there accumulate to an immense extent, and in fact there is more injury done there than in any other part of the river?—That is quite true. The floods do pass over a very large extent of land, but still very much less than formerly, and in regard to that branch of the river which he proposes now to open up, it is by no means clear on the plan that it was intended to leave it open.

164. It is stated in Mr. Lynam's Report, that the five Commissioners under the Act 5 and 6 Vict. proposed it, that it was delineated on the map, and the land was actually purchased and paid for. The land remains still not cut away; the river channel is not widened, though the second channel is shut up by large embankments?—Yes, I have already stated that a piece of land 40 feet in width was not cut away which was proposed in the plans should be cut away; there it remains still; but in regard to the shutting up of the second channel, I think it is very doubtful indeed whether it was not intended to close that. I think the formation of a dam at the head of it in all probability was originally intended, though not shown upon the plans, because the lower end of it is shut up. Had the lower end of that branch of the river been left open, or any works shown by which it was proposed

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posed to get rid of the water, it would have been clearly a deviation from the plans, but there is nothing of the sort.

165. Mr. Bateman states, as I said before, that that makes a difference of about three feet in the level of the river?—It would lower it to that amount I have no doubt if it was opened up, but it does not follow that it was an omission in the plans, and that it was originally designed not to close it.

166. They should either have cut away the land, or not stopped the gap, so as to prevent the escape of the flood?—The funds were insufficient to enable them to cut away the piece of land referred to, and probably the cost of cutting away that piece of land would have been much the same as the cost of making a new channel to carry off the waters by the second branch which was closed.

167. But they did not make the new channel?—No; because there was no money for it. It was not shown on the plans.

168. They stopped up one, and did not make the other?—It was shown on the plans that one was to be shut up.

169. I only put it to you as a simple engineering question. Was not that a considerable grievance to the public?—I can scarcely admit it to be a grievance, because no injury was done.

170. Not by raising the water three feet?—No, it did not raise it. I beg your pardon, the water was considerably lowered, as compared with the former state of things.

171. I ask for explanation, because Mr. Bateman states that it would be a most important alteration, and the water would have been lowered three feet, if the original plan had been carried out, opening the gap that existed before which was a safety valve for the river, or widening the river to the proposed plan, which was the intention of the five Commissioners?—I do not think he makes that statement.

172. Taking your Report all through, can you give any other answer than that drainage was originally intended in the proposals made to the Government, and in all the Acts of Parliament that have been passed relating to the Shannon from the very earliest to the present, and that the intention of lowering the river was to improve the lands as well as to improve the navigation; in fact not to do an injury to the land owners while improving the navigation?—It was always contemplated that the water should be confined to the natural bed of the river, and as a consequence that the very desirable object of the improvement of the lands should follow.

173. It was not confined to the bed of the river?—It has not been confined to the bed of the river, neither was it fully expected by the Commissioners that it would be.

174. Mr. *Pollard-Urquhart.*] Has it been confined to the bed of the river as far as contemplated?—Not as contemplated, not to the full extent, but I think it was not expected by the Commissioners that it would be. That appears from their report.

175. Sir *Graham Montgomery.*] If all the works contemplated were carried out, even then it would not be?—It would not be confined altogether.

176. Colonel *Vandeleur.*] But the floods would not have existed and been so great as at present?—No, they would not have been quite so great; but I beg to remark that notwithstanding the deviations from the original plans, the lands have to a very considerable extent been relieved, and the levels of the river in summer, as well as in winter, have been very materially lowered.

177. The sill of Victoria Lock, at Meelick, is higher than it was arranged to be?—It is six inches higher.

178. Mr. *Bonham-Carter.*] You have been asked whether you are of opinion that the drainage of the Shannon was one of the considerations with the Commissioners; and you stated that, although it was considered important, it was considered secondary and incidental; will you refer to the Second Report of the Commissioners, "General Principles for the Improvement of the Shannon;" in that statement of the general principles it is stated the Commissioners anticipate such an increased rapidity in the discharge of the water in wet seasons, as to prevent the flat meadow lands adjoining the river banks being flooded, as they are at present, during at least six months in the year; does that statement of the general principles conflict in that point with your view, or do you consider that it is also an evidence that though drainage is important it is incidental?—I do not think it conflicts at all with my view.

179. Will you refer to page 17, "Difficulties in the Navigation;" the navigation is said there, owing to the peculiarity of the river, to have been comparatively useless; that owing to the banks being flat and very slightly elevated they are liable to floods, and circumstances render the formation of towing-paths in many parts quite impracticable, as previously described; was it for the purpose of raising those banks to improve the navigation that the control of the floods was there considered desirable?—I think so.

180. In the same page reference is made to flooded lands; do you consider that the regulation of the waters that is referred to there was more than subsidiary and incidental to the navigation?—The banks of that portion of the river, of which we have now been treating, are in many parts subject to floods which extend more or less over the country, reducing the herbage to a coarse quality, covering the lower meadows, or callows, for several months consecutively, and not unfrequently inundating them in summer, and thereby destroying a crop. There cannot be a doubt that a successful regulation to prevent the rising of the waters, such as we anticipate from the effect of the weirs at the falls of Killaloe, Meelick, and Athlone, will cause a great, though unequal degree of improvement in the lands that are thus subject to the floods; such as are naturally fertile, though now covered by herbage of a coarse quality, may hereafter be tilled, and become profitable under arable cultivation; or, if preferred, may be continued as meadows, but of a very superior quality, and many portions of the lands relieved from the most injurious inundations, will, in future, be susceptible of irrigation at pleasure." I think that was all consequent upon the confinement of the waters to the natural channel for the purpose of navigation.

181. Will you refer to page 19, in the consideration of the expense of the apportionment of

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of the outlay?—"The benefit will be partial, perhaps imperceptible, and almost entirely dependent upon future management; for many of those lands, under the present disadvantages, yield a good crop. The tax must be so inconsiderable, so difficult to applot and to levy, and of so irritating a character, that we cannot perceive how it can be done with justice, and therefore do not recommend its being attempted."

182. Then I conclude that the Commissioners did not consider that the advantages from the drainage of the lands adjoining the banks of the Shannon were sufficiently important to justify a tax, nor that if that tax were apportioned it would raise a large sum?—It appears so.

183. Will you look in the same report at "the effects of the proposed improvement": there are six improvements stated, will you refer to them?—Yes; shall I read them?

184. Do not the first three refer solely to the improvement of navigation?—Yes. "1st. This river, which so peculiarly intersects Ireland, will be relieved from the very dilapidated and inefficient state in which the greater part of the works of it are at present. 2nd. The extent of shores on its lakes and wider waters will be rendered available to trade. 3rd. Facilities will be at once afforded for bringing various tributaries that penetrate the country in different directions into navigable communications with the river, and by its means with the ports of Dublin and Limerick, 4th. Bridges on the great lines of communication will be improved, or new ones constructed. 5th. The lands relieved to a great extent from injurious floods. 6th. A vast amount of well-regulated water power obtained."

185. Do you think, then, that the admission of the fifth clause is important, and does that conflict with your view that the drainage was not more than incidental?—No, I do not think it conflicts at all with it; at the same time I think that the drainage was always looked upon as a matter of great importance, and a very desirable object, by the Commissioners.

186. With regard to the assessment, the principle on which the recommendations are made is, I believe, that the Government should advance one-half, and that the remainder should be assessed, one-half upon the county at large and the other upon the baronies adjoining the river which would derive the greatest direct advantage from the improvement. That improvement, I apprehend, after the clause you have read with reference to the tax upon the drainage area, implies solely an improvement of traffic?—Entirely, and dependent on the improvement of the navigation.

187. The Commissioners, then, advised that those owners who would be incidentally benefited by the drainage should be relieved of any special taxation?—They did.

188. Will you tell me the date of that report?—1837.

189. That being the date, was not this report published before, and were not the facts it set forth known before the passing of the Act for the execution of the works?—They were.

190. Then the basis of taxation was known, and it was not a consideration that there would be any considerable relief from the contributions of those benefited by the drainage at the time the Act was passed for executing the works and laying the charges?—It was contemplated that the entire charge would fall on the counties and baronies for the navigation, and no part for the drainage improvement.

191. And that report was issued some years before the Act was passed, which ultimately authorised the charges for the works?—It was.

192. *Chairman.*] According to the Shannon Commissioners, drainage was the second object they had in view, and navigation the first, the view of the landed proprietors, by whom the expense was to be borne, being totally opposite. Had the landed proprietors any opportunity, and could they in any way control the course pursued by the Commissioners. Was it made known to them what they were doing, or had they any power to interfere in any way in stopping the blunders of the whole of this business of the Shannon?—I really do not know what opportunity they had.

193. Had we any power to interfere? Had we the opportunity of coming before anybody but the Commissioners themselves, who were judges, jury, and everything? (No answer.) If you do not contradict, I may take it that there was no power on the part of the landed proprietors or the counties, by whom the expense was to be borne, to interfere with anything that was laid down in print by the Commissioners.

> Mr. *Sclater Booth.*] Upon that point, will you allow me to suggest that I suppose the counties interested had representatives in Parliament, and might have taken exception to the terms of the Bill.

194–5. Mr. *Ormsby Gore.*] You have read some paragraphs from the second report of the Commissioners, bearing upon the question of drainage. This is the third report. Will you have the goodness to read from it this paragraph with regard to the fisheries?—"With regard to the fisheries in the rivers, we find it necessary, for the purpose of the navigation and the drainage, that all weirs that have been used for the purpose of catching fish, excepting the salmon weir, near Limerick, should be removed."

196. Will you read this from "General Measures of Improvement"?—"In forming projects for the improvements of the drainage (as well as of the navigation) we consider that much will in every case be effected by the removal of the eel weirs."

197. Go on, if you please?—In the following paragraph it is said, "It consequently becomes desirable, for the purpose of drainage, to lower the water permanently, which can be effected, in a great measure, by the removal of the eel weirs and the shoal at Castle Troy; but we recommend that these improvements should only be undertaken at the desire, and partly at the expense of the proprietors, who will exclusively derive benefit from the proposed works." "In respect to the drainage of the flooded lands on either bank of the middle Shannon, we still believe that the object will be as fully obtained as we had ever contemplated."

198. Mr. *Gregory.*] Just read the next paragraph?—"And on the Upper Shannon, where, the improvement in the drainage is universally sought for, we feel assured of the most successful result." Will you, in regard to that, allow me to remark, that the drainage which is, to some extent, there referred to, namely, at Castle Troy, is the prevention of injury to drainage by the works undertaken for navigation, which would have followed if the works to prevent the injury had

not

not been carried out. What I mean is, that there were no works necessary there for the purpose of navigation at all; it is quite away for the navigation, but the works for the navigation above entailed the bringing down of a great volume of water, which would have seriously injured the lands below, if some compensating works were not carried out.

199. Mr. *Ormsby Gore.*] Then, in effect, additional water coming from above, and not sufficiently discharged below, tended to raise the flood?—Certainly, unless measures were taken to prevent it.

200. Mr. *Pollard Urquhart.*] But were proper measures taken in this case?—They were.

201. Have they succeeded?—Entirely.

202. Entirely?—Entirely in preventing injury.

203. *Chairman.*] When were you appointed chariman to the Board of Works?—In 1862.

204. Were you employed by the Board of Works in any other situation before your appointment as chairman?—I have been a member of the Board since 1856.

205. But you were not a member of the Board at the time those original plans were made by the Commissioners, nor were you a member of the Board when those works, as laid out by them, began to be executed?—I was not.

206. Are you aware that originally the Commissioners, in stating how the levy of the money advanced by the Government was to be repaid, proposed that it should be paid from the tolls of the river?—They anticipated that the tolls on the river would cover ultimately the amount to be advanced by the counties.

207. Do the tolls at this moment pay more than the paltry salaries of the lock-keepers?—Besides maintenance, they do not.

208. For how long have they failed to do so?—For five years.

209. I believe the plan, as originally laid out, was to keep the depth of six feet of water?—Six feet six inches.

210. For a navigation which, since it has been opened, I do not believe 10 boats in a year have ever gone down?—The trade is very small upon it.

211. Do you think the proposal to keep such a depth of water was justifiable, when for over 100 miles of the Danube the water is not above two feet?—The Government thought it justifiable at that time.

212. You are not aware of any original Report by Mr. Rhodes, estimating the entire expense for the benefit of the counties at, I think, 174,000 *l.*, made previously to any of those to which you have referred?—I have not seen any.

213. As a matter totally independent of this question, do you not almost concede that any people in their senses would allow any work, for which they were to bear the expense, to be executed in the manner in which this Shannon business has been carried out; I had better probably give you a specimen: for instance, you leave to the same body the making of the plans and surveys; you also confide to them the estimate of the cost of every portion of work which they propose to be executed; you also allow them to take upon themselves the execution of these works; departing from the ordinary way in which public works are done, viz., by separate contracts; you leave in their hands the approval or disapproval of all the works which have been executed by themselves; you allow them ultimately to allocate, according to a supposed benefit, on a proportion of the charge to be borne; and from any one of those Acts there is no appeal of any kind given; they are absolutely masters of the entire situation, and can do what they please; is not that the way the whole of that work was carried out?—The whole thing was carried out under the authority of Parliament, in conformity with the enactment of Parliament.

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214. Parliament undertaking to pay the half of 550,000 *l.* or 580,000 *l.* for work that, if left to ourselves, we would have done for 174,000 *l*?—I could not possibly answer that.

215. You are aware that, besides this business of the Shannon, a great deal of public works, such have been alluded to by the Member for Leitrim, have been carried out; that is, what they call the arterial drainage?—Yes, I am aware of that.

216. Are you aware of any works in any country about which there is the same opposition and the same disapprobation as to the way they are carried out?—I really am quite unable to answer the question.

217. Are you aware that some of the certificates have been sent down that bridges have been finally completed, and that they have been approved of by the Commissioners, when not a stone of those bridges has been laid?—I am not at all aware of what you allude to.

218. One case I can tell you of in the county of Roscommon, where a certificate was sent down for six bridges, not one of which was commenced?—

219. Are you aware that the estimates which have been made by the Board of Works for all the arterial drainages were far from being sufficient for the payment for the works, as they were carried out under the control of the Commissioners?—They would not have been, but for circumstances over which the Board had no control.

220. Will you be good enough to explain what those circumstances were?—The impossibility of getting funds to carry them out, and the consequent great delay.

221. In getting funds?—Yes, funds.

222. Why, you had the funds from Government?—No; it was intended they should be derived from private sources, from the proprietors.

223. Were the funds in any case provided from private sources?—Yes.

224. Probably in the case of the Blackwater they were?—And in a considerable number of other cases.

225. Has not the Commissioner of Public Works a large sum of money invested, to be applied, under certain rules and regulations, to the widening and deepening of all the tributary rivers in the country?—The Board of Works were empowered to carry out a number of works that were called for by the proprietors themselves, with money provided by Government no doubt; and I think I may say that, with scarce an exception, these works were all very economically carried out; and it is no proof they were not so because the estimates were exceeded; and I may mention, in proof of this, that at the present moment the 14 districts in which drainage works are being carried out by the proprietors themselves the cost largely exceeds the amount of the estimate.

226. You would not call the work economically

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carried out, where the expenditure considerably exceeded the estimates?—Yes; I would.

227. You were obliged in a great number of instances to apply for what they call second assents?—Yes.

228. So much were the proceedings under the Board of Works disapproved, that I believe, in the majority of cases, the proprietors refused their assents?—In 11 cases out of about 100, I think they did.

229. Only 11?—I think that was all.

230. Were the works in the remainder of the 100 cases so near completion, and was the expense of completing them so trifling, that it was impossible to leave them as they were?—It may have been so in some of them.

231. You say that the Board of Works have power to refuse application for artificial drainage, and that they sometimes do exercise that power?—Yes; they have the power, and they have exercised it.

232. In fact, I may presume that your refusal to advance the funds would be a sufficient indication of your disapproving of the work?—We have never come to that point; we have always intimated to the promoters of these drainage measures, that the benefit they would derive would be quite incommensurate with the cost, and they have at once accepted that explanation, and given up the idea.

233. Upon one of the tributaries of the Shannon, the Suck, a report was made by an officer of the Board of Works, I think, putting an estimate of what was required at about 270,000 *l.*?—It was 179,000 *l.*, I think.

234. You also made an estimate of the lands that would be improved, and I believe you could not estimate anything at all that would give two per cent. on the amount of money invested, from the return to be obtained by the improvement of those lands?—I am quite unable to express an opinion, either as to the sufficiency or excess of the estimate, or in regard to the value of the benefit that would be conferred in that case. I can only state that the extent of land proposed to be improved on the Suck was 72,000 acres, and the annual benefit that was expected to be derived from its improvement, at a cost of 179,000 *l.*, was about 13,000 *l.*

235. Some of your calculations have not been borne out by the results. I allude to Lough Neagh. All the land about the borders of Lough Neagh that gave meadow worth 3 *l.*, 3 *l.* 10 *s.* and 4 *l.* per acre, have been left dry shingle, and give nothing at all?—I am not aware of that, it is considered a very satisfactory district.

236. After the conclusion of the entire of these Shannon works, and before the parties by whom half the expense was to be borne could know anything about it, I believe you gave one of your Commissioners a retiring salary of 600 *l.* a year for the efficient manner in which he carried out these works?—He was not one of the Commissioners of the Shannon.

237. Not of the Shannon; he was a public works commissioner?—I am not acquainted with the circumstances.

238. I believe the chief work executed by him was on the Shannon, and from the manner in which that was executed, he got a retiring pension of 600 *l.* a year?—He was not employed on the Shannon, except as an executive officer; he was subsequently a member of the Board of Works, and the circumstances connected with his retirement I know nothing about.

239. Mr. *Sclater-Booth.*] I have one general question to ask you. Is there any instance within your experience where public works, executed under your Board, by local or public funds, having been completed, the contributions of parties interested having been assessed, the money repaid, and a period of years having elapsed, it has been proposed to re-open the terms and conditions under which the works were originally so designed, executed, and paid for?—I am not aware of any.

240. If that be so, should you think it, *à fortiori*, inadmissible, in a case where the terms and conditions had been laid down by Act of Parliament, to re-open such considerations?—I should think not, as far as I may venture to express an opinion.

241. Mr. *Pollard-Urquhart.*] Do you know anything of the Inny drainage before 1846?—I am acquainted with the whole of the circumstances of the Inny drainage.

242. If I recollect rightly, the whole of the money raised under the Act was spent, and the works left incomplete. I am referring to what took place in 1848 and 1849?—The Inny district is one of the 11 to which I have before alluded. The proprietors in that case declined to give their second assent, as it is called, to the further proceeding of the works after 3 *l.* an acre had been expended. The works were held over for a great number of years in consequence; and after the passing of the Act 16 & 17 Vict. c. 136, the works were resumed to a certain extent, under the authority of the Treasury, who were authorised to make such a remission of the charges as they might think proper. They were brought to completion, and a very much diminished charge was imposed on the proprietors.

243. Does not that form an exception to the answer you gave to Mr. Sclater-Booth just now?—I understood his question to refer to a work completed. This was a work in progress.

244. Mr. *Ormsby Gore.*] Did you say that the Inny drainage had been completed?—No. I beg your pardon; I said that in the case of the Inny, after 3 *l.* an acre had been spent on the works, which were then in a very incomplete state, the second assents which were necessary, under the Act 9 Vict., had to be obtained. The proprietors declined to give those second assents. Then the works remained suspended until the passing of the Act 16 & 17 Vict., which empowered the Treasury to order the works to be completed to such extent as was expedient, and to make such remission as they might think fit and proper. Thereupon the works were brought to completion.

245. How long subsequent to the first Act was the Act of 16 & 17 Victoria?—That was in the year 1854.

246. And when was the first Act passed?—The original drainage Act was in 1842. The Act under which the Inny drainage was undertaken was in 1846; that was 9 Victoria.

247. Then it was eight years after this first Act was passed that the second Act was passed for completing the works?—Yes, for completing the works.

248. With Treasury money?—Yes.

249. And I think the whole of the money that was raised under the first Act was spent, although the works were left in an incomplete state?—

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state?—There was no money raised under the first Act at all; it was advanced by Government.

250. But the whole of that was spent, was it not?—Not at all; only 3 *l.* an acre was spent, which left the works in a very incomplete state.

251. The whole of that authorised by the Act of 1846 was spent?—The Act of 1846 required that after 3 *l.* per acre had been spent on works, before proceeding further, the assent of the proprietors should be given to the further expenditure necessary; but the proprietors, in that particular case, declined to give that assent, and therefore the works could not be further proceeded with.

252. Colonel *Vandeleur.*] Was there not an estimate made, embracing the whole of the works in that instance; did not the original estimate take in the entire of the works, and the proprietors assented, with the understanding that that was to complete the work?—

253. Mr. *Pollard-Urquhart.*] Along the whole course of the river?—

254. Colonel *Vandeleur.*] When the proprietors gave their assent in the first instance, was not that to an estimate to complete the work?—It was to complete the entire district shown upon the plans.

255. Exactly; they did not contemplate a second assent being required?—Yes, they did. No greater expense could be incurred than 3 *l.* an acre, without their second assent.

256. When the estimate was made out and submitted to the proprietors, did they not understand that that was the full sum required to complete the works?—Yes, they had an estimate put before them, which they were given to understand would enable the works to be carried out; but as that estimate was to meet a great emergency (the famine of 1846) made in a very cursory way, the proprietors were, to prevent their being involved in an outlay which they might subsequently disapprove, given by the Act the privilege of withholding their assent to any greater expenditure than 3 *l.* per acre, on which limit being attained, the Commissioners were bound to bring the case before them for their decision as to whether they would proceed or not.

257. Mr. *Ormsby Gore.*] The works along the whole course of the river?—Yes.

258. Colonel *Vandeleur.*] Are you aware of other works that were in similar circumstances?—There were many more under similar circumstances.

259. That is, where the estimates were made by the engineers of the Board of Works, and where the proprietors were called on afterwards to pay a much larger sum, and would not assent?—No, they were not called upon to pay, but they were called upon to give their assents to an expenditure in excess of 3 *l.* an acre.

260. That was being called upon to pay, and they declined; refer now to the Fergus drainage; that was one of the cases?—The Fergus was undertaken under different circumstances; it was undertaken under the original Act of 1842.

261. But it was under the same circumstances; the proprietors had an estimate submitted to them by the Board of Works contemplating the entire expenditure, and were afterwards asked to give a second assent for double the money, was it not?—For an increased amount. I do not think the Fergus came under the same category, but in all those districts the proprietors were required to give their assent to an increased amount of expenditure. The second assent was necessary not for the increased amount, but to enable the works to be carried on after 3 *l.* an acre had been expended.

262. We are not talking about 3*l.* an acre, but about the original estimate to complete the works? Even if the expenditure was less than the original estimate, and 3 *l.* an acre had been expended, the works could not be completed without a second assent.

263. But you said before, that the estimate laid before the proprietors and to which they gave their assent, was a full and complete estimate to execute the works?—Yes.

264. Mr. *Sclater-Booth.*] Do you know, on the other hand, of instances in which money advanced for drainage purposes has been remitted to the proprietors?—To a very large amount.

265. To what amount, speaking roughly?—I think the remissions somewhat exceed 1,000,000 *l.*

266. *Chairman.*] It was under the Report of the House of Lords?—

267. Was not the reason of that remission, the works not being carried out by the original estimate that was made by the Board of Works?—That was what gave rise to it, undoubtedly.

268. Mr *Ormsby Gore.*] Do you know how much was drained at the price of the original estimate?—I could not possibly say. About 12 miles of the most important part of the river was completed.

269. About how many miles?—I do not know the total number of miles; but the upper parts of the river and tributaries were comparatively unimportant as regards the extent of the work to be done.

270. Mr. *Pollard-Urquhart.*] Was not the extent of the Inny work done somewhat under one-half that contemplated in the original estimate?—No; a comparatively small sum in addition would have enabled the works to be completed.

271. I should like an answer to my question; were not the works completed something less than one-half of those originally contemplated?—I cannot say.

272. Colonel *Vandeleur.*] Would not the case of Meelick be just similar to the case of the Fergus, or several other cases that have been referred to, where the works were not completed, and where the drainage has been very much affected by their not being carried out; and would you not concede, that if the Government completed the Fergus drainages, and those other drainages for which the estimate had been made by the Board of Works and by their own engineers, they ought to complete the works at Meelick, so as to put the river in the same state as it was before; that is, allowing the flood waters to escape; in the case of Meelick it was stated that the land was purchased, and Mr. Bateman says, that if the old channels were reopened, as now proposed, it would afford a considerable portion of relief; and Mr. Lynam draws attention to the fact that Mr. Rhodes' letter to Lord Stanley of 18th October 1831 proposed to widen one channel to double its sectional area, in order to compensate for the shutting-up of the second channel; and the five Commissioners under the subsequent Act proposed the same width, and delineated it on the map produced by order of Parliament; and they purchased and paid for the

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the land to be cut away, and the land still remains not cut away; the river channel is not widened, though the second channel is shut up by large embankments, and a very large amount of flooding is caused thereby?—I do not think that the cases are at all parallel.

273. I certainly differ in opinion with you most strongly; there was an estimate made to do the work, and if the money was diverted to other purposes, certainly the public are not to suffer?—It is an old story, but still there is time to remedy it.

274. Mr. *Gregory.*] In the provisions to be introduced into the Act of Parliament for the improvement of the Shannon, was it not contemplated that six feet should be the depth of the water on the upper sills of the Lock gates at several places, particularly at Killaloe?—Yes; and at Killaloe it is 6 feet 9 inches.

275. Is that the ordinary height?—That is the lowest.

276. That is, in fact, nine inches above what is recommended in these particulars?—Yes.

277. Do you think there is any objection that any alteration should be made at present in the Shannon, with a view to improve the drainage of the surrounding country?—None whatever.

278. And do you think it feasible that it can be done?—It is perfectly feasible, and merely a question of cost. It is most desirable for many reasons.

279. Have you looked carefully into the reports of Mr. Bateman and Mr. Lynam?—No; merely generally.

280. Then you do not pass any opinion with regard to the calculations of either of those gentlemen?—No.

281. You have no opinion whether the works would take so large a sum of money as 300,000 *l.*?—No; I cannot form an opinion.

Tuesday, 5th *May* 1868.

MEMBERS PRESENT:

Mr. Agar Ellis.
Mr. Bonham-Carter.
Colonel French.
Mr. Gregory.
Mr. W. Ormsby Gore.
Mr. Laird.
Sir Graham Montgomery.
Mr. Pollard-Urquhart.
Mr. Sclater-Booth.
Colonel Vandeleur.

COLONEL FRENCH, IN THE CHAIR.

Mr. WILLIAM FORSYTH, called in; and Examined.

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282. *Chairman.*] ARE you a Civil Engineer?—I am.

283. You have had some experience in the works which were carried on for the improvement of the navigation and drainage of the River Shannon?—I have.

284. You were, I think, as well as I remember, managing or overseeing the works at Athlone?—Yes, I built the bridge at Athlone. I was then employed with Mr. McMahon.

285. That bridge was built by a contract, and you on the part of the contractor overlooked the works?—I did.

286. Mr. *Sclater-Booth.*] How long have you been in the employment of the Board of Works?—I have been employed since the latter end of 1832, altogether, but a part of that time I was directly employed by the contractors.

287. What were the contractors' names?—Henry, Mullins, and McMahon.

288. Did they tender for the entire of the works for the improvement of the Shannon up to Lough Ree?—They tendered for all the works from Limerick to Lough Ree, in the first instance.

289. Did you, being in their employment, make estimates for those works?—I did for all the works.

290. And are you acquainted with all the particulars connected with them?—I am.

291. Was there in these works any estimate for drainage?—None, except such incidental drainage as might be effected by the plans devised for the navigation.

292. You are well acquainted, then, with the execution of all the works estimated for by the firm under which you were serving?—I am.

293. I will, if you please, take you through some of the details of the works, and I will do so as shortly as I can. What was the intention in constructing the weir at Arthur's Ferry?—The first object was to preserve the head of water to the short reach of the Limerick navigation about a mile and a quarter between Arthur's Ferry and the city of Limerick. Then there were other interests involved in it. There were large mills at the lock called the Lock Mills, large mills at Corbally, and the salmon weir at Corbally, generally called the Lax Weir.

294. Was there in that work a change in the original plan?—There was. That was the first of what might be called the deviations.

295. What was the object of that deviation, and what was the authority for it?—The weir on the original plans was not executed; a new weir was constructed on the site of the old Corbally weir. The river channel was deepened from the end of the Limerick navigation downwards, through Athlunkard Bridge and on to the weir at Corbally. Athlunkard Bridge was underset and the foundations secured and paved.

296. There was a power, I believe, of charging lands that were to be peculiarly benefited by the drainage, with a special rate; was there not?—Yes, where a peculiar benefit was to be conferred, but there was none such.

297. And no lands were made chargeable?—No lands were charged except in the general assessment.

298. What was the intention of the works at Castletroy and Plassy?—The work executed there was very small.

299. Had it any relation to drainage?—It was one of those places that was reserved, and the instructions under which those works were to be undertaken, was that the drainage should be undertaken at the request and at part expense of the proprietors.

300. It is stated in answer to Question 550, in Mr. Long's evidence, that the object of the works at Castle Troy and Castle Connell "related to drainage, they had no relation to navigation;" do you agree with that statement?—There was a correspondence, but it had no effective result with Lord Clare and other proprietors there, and the works were not executed as shown on the original plans. There was an impression that the quantity of water thrown down there might be greater than it previously was, and that some injury might be done to the lands; therefore a small portion of the shoal was taken away.

301. In regard to the works at Killaloe, a large item, I see, was charged; was that for drainage or for navigation?—For navigation; it may be said to have been for drainage in so far as the incidental drainage arising from the works of the navigation was involved.

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302. Were the works at Meelick designed for drainage or for navigation?—They were of the same character as those at Killaloe.

303. If no works of navigation had been executed at Meelick, would the works that were constructed have been required for drainage purposes?—They would. Of course the navigation lock had no connection with the drainage, but if the navigation was to be maintained, the head of water must be kept up.

304. Have you a similar remark to make with regard to the works at Athlone?—Precisely the same; there was a deviation there also.

305. Were those alterations beneficial to the drainage?—They were.

306. There were some changes made, I think, at Tarmonbarry and Cloondrah?—Yes, there was another deviation there.

307. Were these changes beneficial to the drainage, so far as they went?—They were. It was proposed originally that the River Shannon should be slightly improved, and that a new side cut connecting Cloondrah Lock with Lough Forbes should be made at great cost. However, it was not properly speaking a deviation, but an alternative, because a reserve was made that either plan might be adopted when more information should be obtained. Then they adopted the plan of improving the river course, and spending all the money there, so that it increased the size of the channel for the discharge of the floods, because the side-cut would have been of no avail whatever to the discharge of the floods.

308. Generally, were the works proposed in improving the river channel for drainage, or were they necessary to improve the navigation?—They were necessary to improve the navigation.

309. They were generally necessary for the improvement of the navigation?—Mr. Rhodes states most distinctly that his primary object was to lessen the inundation so as to define his sailing-channel, because previously, when the floods were high, it was with the greatest difficulty that they could keep the channel, and the navigation was very difficult. He gives a description of it in his third report, which was quoted in the Report of the Select Committee of 1834, I think: Then the question was put to him, whether he would make any change if the question of drainage was to be left out altogether. He stated most distinctly that he would not; the works were necessary for navigation.

310. Would the works of improvement in the river channel have been more beneficial to the drainage if constructed according to the original plan, than those executed according to the altered plan?—I think they are much more beneficial according to the altered plan, because all the money was spent in the river channel. Therefore it facilitated the discharge of the floods and reduced the inundation.

311. Going further, there were some works at Drumsna and Jamestown; were the works there executed in the river channel for drainage purposes, or for the improvement of the navigation?—The old side-cut, or canal, was improved at Jamestown and a new lock built. The river channel was improved for navigation up to the town of Drumsna, and a small wharf was built there. From thence to the head-weir at Jamestown Mill the shoals were reduced to give a free passage to the floods, to prevent back-water to the head-weir at Jamestown Mill; so that in carrying out Mr. Rhode's views, they intended to reduce the inundation above Jamestown head-weir, and at the same time they were beneficial to the drainage, because they allowed a readier escape for the water. However, that is only as to the general drainage incidental to the works of navigation.

312. I take it, that according to your view, the works proposed for the Upper Shannon, between Battle Bridge and Lough Allen, were also, as you stated the others were, for the improvement of the navigation, and not in the first instance for the improvement of the drainage?—There were certain works proposed, but at an early period the Commissioners reported in one of their reports, under the 5 & 6 Will. 4, c. 67, that after much consideration they would not, or did not intend to execute the works proposed in the river between Battle Bridge and Lough Allen. They did propose to improve the old canal, and to construct a small harbour at Drumshanbog; there was some proposition about regulating the outfall of the water from Lough Allen, but they did not propose to execute the works in the river; and they also state they had not included them in the general estimate for the works.

313. The entire amount of the estimate for the construction of the whole of the works was 584,000 *l.*, or thereabouts, I believe?—It was.

314. Did difficulties arise in the execution of the works, so as to increase the cost beyond the money provided for in that estimate?—There were a great many difficulties that arose, so that the cost of the execution was much more than anticipated, more than the estimated sum, and also more than the estimate of the contractors.

315. How many new bridges were built in place, I mean, of the repair which was contemplated by the original plan?—Five.

316. Why was it necessary to rebuild these bridges?—Mr. Rhodes has given a particular description of the bridges in his third report; that they were in a dilapidated condition, and that if not thoroughly repaired, in a few more winters they would fail altogether. The first of these bridges in which an alteration was made was Lanesborough Bridge. I know Lanesborough Bridge very well, because we estimated for the works at Lanesborough. It was a common country rubble bridge, badly constructed; especially the foundations were in a dilapidated condition. When originally built, it was built on what is called an artificial foundation. A large quantity of loose stones were thrown into the river, and the piers were built upon them. In the execution of the works, when the dams were put in it was found they could not be underset; we were underbid, and did not get the work; they were done by Messrs. Brookfield and Sykes.

317. But, without going into details as to the bridges, can you say, generally, whether the new bridges, as reconstructed, were more beneficial to the navigation than the old bridges could have been, supposing they could have been underpinned?—That is my opinion; and in contradiction to what has been generally stated, they cost less money.

318. *Chairman.*] Cost less money than what? less than the estimate?—Less than the repair of the old bridges would have cost. The estimate for repairing and improving the old bridges was 18,823 *l.* 14 *s.* 5 *d.*; that is for all the five. The cost of the new bridges that were substituted was 16,942 *l.* 9 *s.*, showing a difference, as a saving, of 1,881 *l.* 5 *s.* 5 *d.*

319. Mr. *Sclater-Booth.*] Was the whole of the money provided for deepening the shoals applied for that purpose?—It was.

320. No part of it withdrawn?—No part of it withdrawn.

321. Or applied to other purposes?—No; indeed there was more money expended than was provided in the original estimate.

322. *Chairman.*] With regard to the shoals, the works were not executed according to the plan?—They were executed as far as possible. We must admit that some of them were not excavated to the estimated width. The whole of the money was expended; but when the money was expended, of course no more could be done. It was intended that, if the proceeds of the navigation should afford an annual sum, that work should be completed afterwards, but that was not the case.

323 Mr. *Sclater-Booth.*] Can you state whether the works, as executed, have realised the expectations of the Commissioners in preventing the increase of the inundation of the lands?—I think the most direct answer to that question is, that I understand (although I have not been furnished with a copy of the valuation made by Mr. Brassington and Mr. Lynam) they have returned 20,000 acres as being yet liable to floods. The original quantity was 32,000 acres. That makes a difference of 12,000 acres; therefore those 12,000 acres must have been relieved. The statement of the Commissioners, in their report, was, that there were 18,750 relieved; but, according to that examination, I understand there were about 20,000 acres still flooded: therefore there are 12,000 acres relieved.

324. Were any of the weirs raised higher than contemplated by the Parliamentary plans?—The weir at Killaloe is about six inches higher. It was intended to be six feet over the sill of Killaloe Lock. It is of an irregular crest. The average is somewhere about six feet six inches.

325. Were any of the weirs built of a less length than shown in the original plans?—They were, in all cases, increased in length.

326. Were the plans prepared under the supervision of the Commissioners, and did they meet with their approval before they were submitted to Parliament?—They were. The original designs were prepared under the direction of the Commissioners, and approved of by Parliament; but in the execution the weirs were constructed longer than they were designed.

327. Were the depths of the several reaches of the river channel preserved as shown on the original sections?—I believe they were.

328. *Chairman.*] Can you produce the sections of the several weirs in the Shannon made after the notices were posted upon certain houses; I think they were mentioned in the evidence of Colonel McKerlie, and we have never seen them; you have them at the Board of Works?—I think we have. I cannot produce them; but they could be produced, no doubt.

329. Mr. *Sclater-Booth.*] Was there at any time an intention of placing the crests of the weirs at a lower level than that shown on the original plans?—None that I know of. There was a doubt at the time that the weir at Meelick was built, about what would be the most beneficial level to place it at. It was left for a time until they saw the effect that the floods would have on it, and then it was finished.

330. Mr. *Gregory.*] Is that a correct answer as regards Killaloe; did not Colonel McKerlie himself allow that it was 9 inches higher than was originally intended?—It depends upon how the average is struck. The crest of the weir is irregular. The end next the lock is 7½ feet. It diminishes, not very regularly, until it comes to about 6 feet 9 inches.

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331. Was not 6 feet originally contemplated?—It is 6·57, that is 6½ feet. I added up the various heights, and the average I got was about 6 feet 7 inches, or 6 feet 7½ inches. The intention was to increase it 9 inches, but it is not 9 inches altogether.

332. Whose intention?—The order was made according to a minute of the Board.

333. Mr. *Ormsby Gore.*] This affects the river in its whole course downwards?—It can only affect it as far as Meelick.

334. Mr. *Sclater-Booth.*] I want to call your attention to a statement that was made in evidence before this Committee: it was stated that wherever the navigation was by canal, in that case any works executed in the river itself were necessary works for drainage only; do you agree with that statement?—I do not; because it is often stated and adverted to by Mr. Rhodes that the works proposed were necessary to reduce the inundation; that is, to confine the water to the channel, if possible. Perhaps his anticipations were rather sanguine, but his intention was to reduce the river as far as possible, to keep it within its own boundaries, so that the channel would always be completely defined.

335. Was it ever anticipated that the works, as shown in the plans, would have confined the flood-water to the channel of the river, and prevented the inundation of the lands?—No; it was never stated that it would have the effect of confining the water solely to the channel of the river. Mr. Rhode's statement was, that in the then state of the river, the lands were flooded for six or seven months of the year, and that when those works were executed, they would not be inundated for more than three or four months, or perhaps less.

336. *Chairman.*] I believe Mr. Sclater-Booth alludes generally to the flooding; but the objection is to summer flooding, which destroys everything?—He made no distinction between summer and winter. It was the general plan adopted to reduce the inundation for the benefit of the navigation, in the first instance; and of course, when a benefit was conferred in that shape, it was beneficial to the relief of the lands.

337. But did not they undertake to keep the river at a smaller level?—I cannot find it anywhere so stated. There is not a figure, nor a line, nor a statement in any of the plans, that shows the real height to which the flood-water was to be kept.

338. Mr. *Sclater-Booth.*] I believe there was an excess in the expenditure upon the works at the bottom of the river channel at Clerham?—There was.

339. What was the cause of that excess of expenditure?—The Shannon is the natural drain of the whole valley, and it turned out that in that shoal at Clerham there was a cavernous limestone rock; that could not have been known before the water was pumped out. When the river water was pumped out, then the spring water flowed so fast in through the joints, that they were not able to execute the works: and they put up one steam engine after another, until, I

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believe they had six or seven at work at one time before they were able to master it.

340. Flowing into the Shannon?—Flowing into the dam; because the spring-head upon the other side pressing up when the counter presure of the Shannon was removed, it caused the water to flow rapidly into the dam. We had the same thing at Athlone, though it was less difficult to deal with there; we dried all the pumps in the town.

341. *Chairman.*] The Commissioners had several years to consider their plans, and under those circumstances is there any excuse to be made, when you find that the money estimated is not sufficient, owing to what you call "unforeseen difficulties"?—I am not aware, that in all the services with which I am acquainted (and I have been a good long time employed in the profession), that the water was ever pumped out in any such case to ascertain the quality of the bottom, or how much or how little the difficulty might be in the excavation. There are borings made, but they are very often uncertain. A great many of the shoals of the Shannon are composed of alluvial clay and boulders, and it is not very easy to ascertain whether you are boring through huge boulders, some of them 50 or 60 cubic feet in size, or through the solid rock; and especially where the rock is cavernous, there are joints or fissures in it, so that it is not easy to distinguish whether you are boring through two or three thicknesses of boulders, or going through the jointy rock.

342. But even if you estimated for solid rock, would it not more than cover the expense that you say was unexpected, where there were conglomerate and boulders?—It was not expected that there would be so much rock in that shoal.

243. Mr. *Pollard-Urquhart.*] Are you not aware that Mr. Long has said, that no doubt if the works had been more carefully executed, the estimate would have been more correct?—I can only say that Mr. Long himself was employed in the survey.

344. Then you dissent from that view of Mr. Long's?—Mr. Long was resident engineer at Athlone, and that was within his jurisdiction.

345. Mr. *Sclater-Booth.*] Taking the question of the works at Lough Allen, did it form a part of the original plan to construct any works for the regulation of the levels of the water surface at Lough Allen?—There was an intention of some small works being constructed for a small sum of money.

346. Which was not executed as intended?—No; that, and the small harbour at Drumshanbo, and the lengthening of one of the locks, are the three items in that part of the Shannon that were not executed.

347. Have the trade and navigation suffered from the mode in which the works were executed at last?—I am sorry to say they have not. If there had been a larger amount of trade those works would have been completed since, but there was no trade to demand it. It would not have taken a large sum of money to have done it.

348. Mr. *Gregory.*] Do you refer to the quay that was to have been built at Lough Allen?—There would have been a quay built. I do not think the construction of that harbour was at all necessary, because it is a quiet place at the end of the lough, and it required no harbour; it was not like the open sea.

349. Mr. *Sclater-Booth.*] There was an alteration in the design relative to a bridge at Carrick-upon-Shannon, was there not?—It is one of the five I have referred to.

350. Was the alteration so made, beneficial or otherwise to the navigation of the river?—In my opinion it is beneficial.

351. Where the works at Jamestown Canal constructed according to the original plan?—They were.

352. The swivel bridges over the canal were replaced by stone bridges, were they not?—They were.

353 Why was that done?—They were not necessary.

354. But which were the most convenient to the navigation?—It makes no difference. The whole difference is simply this, that the steamers that go up to Jamestown, and Carrick-on-Shannon, and into Lough Key, must have their chimneys to lower down. It is a very simple matter.

355. There was a weir at Jamestown, was there not?—Yes.

356. The old inch weir was retained there?—No; there was a new weir constructed upon the site of the old one.

357. Is the weir, as it was built, as effective in the discharge of the flood-water as the weir shown on the plans originally designed?—It is more so; it is considerably longer.

358. Should you say the same with regard to the weir at Ruskey?—I would. I had an objection to the weir at Ruskey as shown on the original plans. Although the discharging line of the weir appears to be considerable, it is put into the river in such a way, that there is no freedom of access for the water to approach it; therefore, a great part of the discharge line would be ineffective.

359. Mr. *Ormsby Gore.*] You are speaking of the present weir?—Oh no; the water arrives at the present weir perpendicular to the axis of the stream, the best position in which it can possibly be put.

360. Mr. *Sclater-Booth.*] The navigable channel at Derrycarne was full of shoals, was it not?—There was one small shoal.

361. A channel was cut through that shoal?—It was; I have gone through it myself in a steamer drawing over five feet of water, and we found no impediment.

362. Does that cut cause any increase of inundation to the flat country above it?—I do not think it is the cause of any inundation; although that shoal had not been taken out to the full width, there is an expanse of shallow water in the lake besides.

363. There was an alteration again in the plans of Carnodoe Bridge?—There was.

364. What is the general description of that change?—Originally it was proposed to have a swivel bridge, of 32 feet span, there, and two side arches of 20 feet span; one arch has been built, of 35 feet span, and the river deepened under it.

365. Is that arch of 35 feet span as effective for the discharge of the floods as the small arches of the old bridge were?—I think more so.

366. *Chairman.*] About the rock which you said the fissures were in at Clerhaum; the original estimate for everything to be done there was 174*l.*, I think, as well as my memory serves me?—Yes.

367. Are you aware that the Commissioners returned

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returned the expenditure there as upwards of 1,400*l.*?—£.1,465. 14*s.* 6*d.*

368. And the cost turned out to be 6,000*l.*?—That is nowhere shown, and I deny it; it is nowhere stated in any of the documents.

369. Mr. *Sclater-Booth.*] Has the level of the summer water been altered in the lakes above Ruskey?—The old summer water has been retained as near as possible.

370. At the level shown on the original plan?—On the original plan.

371. Was the channel as executed immediately below the weirs of Ruskey as effective in the discharge of the flood water, and as convenient for the navigation as that shown on the original plans?—If it had been completed it would. There was a point that was intended to have been taken off, that was not taken off. If it had been taken off, the channel as it is would be much more convenient for the combined measure of navigation and drainage.

372. Were the works at Cloneen and Clonfad, for the improvement of the navigation, carried into execution as designed?—The channel is not quite so wide as it was intended.

373. So far as they go, have they had the effect of lessening the inundations?—I presume that a portion of the 12,000 acres that have been relieved are situated in that neighbourhood, because there is a good deal of flat meadow land there, but as I have not the details of the valuation, I cannot state what quantity might be in that neighbourhood.

374. Is there anything in Mr. Kelly's evidence relative to the works at Tarmonbarry and Cloodrah, which requires any explanation on your part; I refer you to Questions 138 to 146 (p. 7); is there anything in those observations that you wish to comment upon?—I have already stated that the side cut was abandoned there, and all the money was expended on the improvement of the river channel. The new weir that was built is much better adapted for keeping down the inundation than the original weir would have been, if executed where it was intended. There is not practically much difference in the length. Then it was stated that the water was raised above the level of the banks. There is a flat piece of land upon the Roscommon side above the weir. The river was embanked at that place, and there was a back drain of about 1,100 yards long, constructed to carry the drainage water below the lock, so as to completely drain the land independent of the river above the weir. Some four or five years ago that embankment burst, during the flood, and the land was inundated, but as soon as known it was repaired again, and has been effective ever since. There has been a good deal said about the difficulty of a boat coming down the Shannon, to go into the Royal Canal, having to descend a new lock, to cross the river, to go into Cloodrah Lock, and rise up to the level of the Royal Canal. Now that is not necessary according to my own observation, because the ancient side cut remains there still; it is the outfall of two rivers, the Camlin and the Keenagh, and not very long ago when I was down there, a boat going up the Shannon did not pass through either of the locks, but passed up that old canal and into Lough Forbes.

375. I am going now to the New Cut at Curreen, below Lanesborough. Has that been as effective for the improvement of the navigation as it was intended to be?—In my opinion it has.

376. Has it been made to the full dimensions shown on the original plan?—I believe so. I passed through it in the Shannon steamer, drawing over five feet of water, and we met with no obstruction whatever. The width mentioned is overstated; there was no intention of making any of those cuts of that width.

377. Something was said about the change of landing place from Gally Bay to Lecarrow?—Yes.

378. Is that made for the accommodation of the contractors for the works at Lecarrow?—No; there are mills at Lecarrow, and Lecarrow is situated on the great public road. It was considered it would be equally as convenient as the other place, where there is no local trade of any kind, and Mr. Bond, who was the proprietor there, interested himself in it, and they agreed to make the change. There were stones taken from the quarry by that canal after it was made. I do not think a stone was taken down there to the bridge; the bridge was built before the canal was finished.

379. *Chairman.*] The stones were all taken from Lecarrow and brought to build the bridge at Athlone?—No; the greater part was taken from Cashel, on the Westmeath side of the lake. We did get stones on that side of the lake, but we had no concern how they were got; we had a contract with Mr. Bond and another man, who has quarries there. They delivered it at Athlone, at so much per cubic foot.

380. That is a particularly fine quarry of Mr. Bond's?—An excellent quarry.

381. Mr. *Sclater-Booth.*] Is there anything in Mr. Kelly's evidence, with regard to the works at Athlone, that you wish to make an observation upon?—Only the observation that has been made about laying the bed of the river dry, after having built the bridge in cofferdams. That arose from an accident. All the works at Athlone are built upon an esker, that is, one of those strange gravel ridges or hills that I believe are almost peculiar to Ireland. It is composed of sand and gravel, and boulder stones. When the head weir was built, to guard it from any accident arising from the quality of the bottom, there was a double row of piles driven, and the masonry was built between those rows and the timbers bound together. They drove the piles to a depth that they thought was ample to prevent any accident occurring. However it appears that it was not in one small portion enough, and the water found its way underneath. There was no possible way of repairing that damage, except by getting the water out. A dam was put in then nearly opposite the Royal school, at the narrow part of the river. The water was turned down the old canal. It was anticipated that with the aid of the old canal and the area of Lough Ree, before the water rose over that dam, this would have been repaired. During the execution of the work they were troubled with water, because the bottom was so low it would scarcely run out; so then they opened the gates of the new lock to allow the drainage water to pass off there. However the water rose until it burst the dam, and the whole flood and damming up of Lough Ree came down upon us. I was sent from Dublin to get the gates of the new lock shut, and with a good deal of difficulty we got them shut at last. There was a small piece of excavation that had

not been excavated, and when they got the water out they took the opportunity of completing the excavation by putting horses and carts into it. That is the history.

382. You do not question the fact that the river was quite dried, and that the expense was very considerable?—That was the fact; but I add this, and I say as a practical man that it was totally impossible to have put in the foundations of the bridge in that way. In the first place, the City of Dublin Steam Navigation Company were carrying on a very considerable trade at Athlone at the time that the foundations of the bridge were put in; they had a regular number of boats coming twice every week, and if that plan had been adopted the navigation must have been stopped, which was not at that time, nor is it indeed at any time desirable. Then, on the other hand, I say it would have been impossible to dam up Lough Ree for a sufficient length of time to enable the foundations to be put in, because they were all piled, and took a great deal of time before they could be done: and then we were very much troubled with floods at the time that work was being executed. Practically it could not be done.

383. Mr. *Sclater-Booth.*] With regard to the inundations below Athlone; are they greater than might have been expected from the plan of the works between Athlone and Meelick?—I think not; they would have been less, no doubt, if the works had been entirely finished to Meelick. I have already stated the channel has not there been taken to the full breadth, but it will be seen at once there is 25 miles between the weir at Athlone and the weir at Meelick; the water will not flow except under a head; there must be a certain declivity per mile. If a very small quantity be given to it per mile, in a distance of 25 miles it will rise to the level of the weir, and if the channel had been of sufficient capacity to have taken away the water at a lower level, there would have been no occasion for the large estimates, that are now submitted to make it sufficient for the purpose. That is a work of drainage that was not originally contemplated.

384. There is one other statement of Mr. Kelly that I wish to speak to you about. With regard to the work at Clerhamm, I think it was stated by Mr. Kelly that that work having been designed to be done for 170 *l.*, cost 8,000 *l.* ?——

385. *Chairman.*] £6,000?—I have answered the Chairman already. There is no statement in any of the documents I have examined, or in anything I have heard, in which any such sum was included. In fact if it cost that sum the Commissioners must have paid it out of their own pockets, because there is no credit given in any place; or to Mr. Mackenzie, although I am almost sure it cost him more than he got for it, but not anything to that extent. It is supposed, from the number of steam engines employed, and so forth, that the expense must have been greatly enhanced, but it must be recollected that Mr. Mackenzie's work was then far advanced. He had steam-engines at Killaloe, he had steam-engines at Meelick, he had steam-engines at Banagher, and at Derry Holmes, and he had only to bring another steam-engine and erect it temporarily, which would not have cost much money.

386. Has not the navigation, in point of fact, been extended to the full length from Killaloe to Lough Allen?—It has.

387. Cannot that navigation be made available for the transport of the minerals said to exist on the borders of Lough Allen?—It can.

388. Leaving the detailed statement that you have been making hitherto, I want to ask you two or three general questions upon the works taken as a whole. Statements have been made with regard to the deviations which occurred between the plans originally contemplated, and the plans as executed. Do you consider that satisfactory reasons can be given for most of those deviations—taking the practical effect of them as a whole, both as regards the navigation and as regards the drainage—are you of opinion that those deviations have had any materially prejudicial effect upon the construction of the works as compared with the design and intention of the Commissioners?—I think that in every case they have been advantageous.

389. Mr. *Gregory.*] Advantageous to the drainage, as well as to the navigation?—Advantageous to the general drainage contemplated by the plan.

390. Mr. *Sclater-Booth.*] And, looking at the question of the expenditure of the whole sum of 500,000 *l.* odd, are you of opinion on the whole, under the circumstances in which you were placed, that the outlay of that sum could have been made with more advantage, both to the navigation and to the drainage?—Generally, I should say not. During the progress of the works, the price of labour advanced very much. If they were to be done now, they could not be done for the same money.

391. *Chairman.*] But was not the entire of the money appropriated to the Upper Shannon; expended before you got past Athlone?—Oh, no.

392. Mr. *Sclater-Booth.*] Especially with regard to the bridges that were rebuilt, and which are alleged to have been rebuilt in an unnecessarily costly manner; are you of opinion that was an expense that could have been avoided?—I have alluded to the description given of the old bridges by Mr. Rhodes, who examined them, and gave his opinion upon them. Of course, he said, they could be underpinned and repaired, but I have had a good deal of experience myself in undertaking these old bridges. They tried Lanesborough Bridge, and, after an expense of 70 *l.*, the contractor was afraid to go on for fear the bridge would tumble down upon him.

393. Supposing the works on the Shannon, for the improvement of the navigation, had never been undertaken, in what position would the lands on its borders now be?—Mr. Nicholson has gone very much into the details of the quality of the lands, and the state in which they were, and there is no question that if those works had not been undertaken or executed, the lands would not have been improved; they could not; so that whatever benefit has been derived, if these 12,000 acres have been relieved from inundation, that relief must be attributed to the works.

394. If these works had not been constructed, would it have cost more to afford the relief as regards drainage which is now sought for, then it will now?—I think as to works of drainage, so as to give an effective drainage, it will not make much difference. I have no doubt that in some instances it may cost more money now to enlarge the channels, because the same means must be adopted to do a small quantity of work that would have served for a large quantity if it had

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had been done all at once; but if I understand the question aright, to give such a capacity to the channel of the River Shannon as will give a drainage, not for extraordinary floods, but for a flood which it may be considered, that it would be advisable to give relief; that is, the flood of 1861 (there were one or two floods since the finishing of the works higher than that), the estimate is about 300,000 *l.*

395. Taking the works as they now are, would it cost more to drain the adjoining lands in combination with the navigation of the river, or by sacrificing the navigation of the river; should you say there was any considerable difference in that respect?—It certainly would reduce the cost to sacrifice the navigation. However, I must confess that that is a point of view in which we have never considered it.

396. *Chairman.*] You have quoted the evidence and opinions of Mr. Rhodes at different times; are you aware that he made an estimate that 174,000 *l.* ought to do all that is required, both for navigation and drainage?—He had a much lower estimate than that. However, the plans which we are in the habit of looking to were those prepared from the survey that was made under 5 & 6 Will. 4, and on which 2 & 3 Vict. was based, for the execution of those plans. I believe Mr. Rhodes had one estimate as low as 15,000 *l.*, but it would have been next to useless. It was merely to apply relief to a few of the worst places. But what I was anxious to show to the Committee was what Mr. Rhodes meant by drainage, and I can find it nowhere stated in any of Mr. Rhodes's reports, or in any quotations from them by either the Commissioners or other persons, that he contemplated any species of drainage except what was incidental to his plan of the works of navigation.

397. Were not all the plans you have ever seen, up to the time the Government thrust themselves into the affair, moderate; I do not think any one of them exceeded 200,000 *l.*?—I am afraid it would be rather dangerous for us to call in question the wisdom of Government in the passing of these Acts; at least I am not disposed to do so.

398. The general amount of your evidence is, that you support all the allegations in the paper that has been put in by Colonel McKerlie; that you consider the alterations have been beneficial, and that the works, if executed according to the original plans, would not have prevented the injurious floods, of which we complain?—That is my opinion; and I will venture to say that if you take those plans and put them into the hands of any engineer, or any competent person, he will see at once that there was no measure of drainage connected with them, except what was incidental to them as works of navigation.

399. And you are also of opinion that the raising of the weirs above the Parliamentary levels has not had any injurious effect upon the adjoining lands?—I did not say so.

400. Did you not say so just now?—No; I confessed that the weir at Killaloe was raised to the extent of seven inches, or seven inches and a half; that is the way I strike the average.

401. Mr. *Pollard-Urquhart.*] You say that the weir is raised higher than it was before; does the water rise higher than it did before?—No; the floods in Lough Derg are not by any means; they are not half so high, except upon extraordinary occasions. They have been rather high in winter, but the winter floods in Lough Derg rose to the extent of nine feet before the works were commenced. But there was no weir then except a shoal, and a series of eel weirs.

402. Then you totally disagree with the assertion of Mr. Kelly, that in the division of Ruskey the water rises 12 or 13 inches higher than it did before any of these works were executed?—At Ruskey?

403. Yes; in the division of Ruskey?—I do not think so.

404. You will not take upon yourself to assert that as a matter of fact?—I very much doubt its being a matter of fact that the floods rise higher. In the statements regarding that we are not referred to any standard; there are certain marks pointed out, but the relative levels between those marks and the old lock sills are not given.

405. Mr. *Sclater-Booth.*] Mr. Penny is furnished with evidence as to that?—Mr. Penny has got a number of levels, and he will be able to state them.

406. *Chairman.*] Is there any use made of the navigation in conveying minerals, or anything else, down the Shannon at present?—I am not aware of any of the mines being at work. The last time I was up there there was no mine at work. Mines are said to exist, but there are no operations being carried on. There is a little done in raising coals, but it is very small. I lived for some time in that neighbourhood, and got some of the coal, but it was not always it could be got.

407. Are you aware that statements have been made by persons conversant with the Shannon, that the works of the Commissioners have injured, and not improved the navigation of the river; that, for instance, on account of the cuts not being the proper width, being only 40 feet, when they should be 100, there is great difficulty in carrying on the navigation there?—There is no instance of that kind to my knowledge.

408. Mr. *Bonham-Carter.*] Did I understand you to say that, on the whole, you believe that both the navigation and the drainage have been improved?—They have.

409. Am I to understand that to include the admission that in some minor cases both drainage and navigation might have been to some extent injuriously affected?—I am not aware of any.

410. You are not aware of any?—I am not aware of any particular case where the operations have been injurious, that is, to inflict an injury that did not exist before.

411. With regard to that upper navigation which has been referred to, in which it is stated that there was no traffic from the mineral district, do I understand you to mean that there is no traffic by canal, or that since railways have been introduced there is no mining work of importance carried on which gets access to it by railroads?—I really would not be able to state the reason why the mines are not in operation. I believe there is a dispute in certain cases about the property, but it is a fact that the mines are not in operation, and if the mines had been in operation, and there had been an amount of trade to demand further works upon that old canal, they would have been executed. At least I state that I believe they would have been, and my reason for doing so is, that the Limerick navigation was not perfect. The new class of boats that the Grand Canal directors have put on could not pass through the locks, and on application those locks

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locks have been improved to meet the requisitions of the trade as modified, and from that I reason that if there had been an amount of trade upon the Lough Allen Canal, to require the improvement as far, at any rate, as it was originally stated, it would have been done, but there being no trade and no funds, it was not considered necessary that the thing should now be done.

412. Mr. *Pollard-Urquhart.*] Mr. Lynam has stated in his report that some of the necessary works were left unfinished in consequence of what he thought unnecessary works being undertaken, and therefore money being spent in the purchase of lands and fisheries which were not necessary either for the navigation or for the drainage; do you totally disagree with that opinion?—I disagree with it so far as the fisheries are concerned, because it was a primary object with the Commissioners to clear away every obstruction; in fact it was the instructions of the Treasury that all eel weirs and other obstructions should be cleared away in the first instance, and it was the first work that was done in the Shannon. There is some property taken that was not required according to the original intention; part of it has been parted with, and part of it remains; however, that which does remain probably might have been disposed of, were it not that for several years there has been an expectation of further works being done, when that property might be required.

413. Then you do admit the partial truth of Mr. Lynam's opinion in that respect, that some money has been uselessly spent in the purchase of lands?—No, I cannot admit it to the full extent.

414. But I say partially you do admit that some money has been spent uselessly in the purchase of lands which were not contemplated in the original plans, and which have not turned out to be beneficial either for the navigation or for the drainage?—Not so far, but if the contemplated works for which the late surveys and estimates have been made are to be carried into execution, that property will be required, and in a good many instances additional property will have to be obtained.

415. But as far as the works have been carried out those lands that have been purchased have been useless?—Well, they were not required in the execution of the works, but still they bring in a revenue.

416. And this deviation from the original plan, which has turned out useless, was made by the order of the Treasury, was it not?—That was ample authority for the Board. The Act of Parliament provided that they were to act under the instruction of the Lords of the Treasury.

417. But they did receive the instructions of the Lords of the Treasury to make those deviations?—I believe so. They themselves stated it in their report; and I think they would hardly have stated to my Lords that they acted under their instructions, if they had not those instructions.

418. Therefore the Treasury gave those instructions to the people carrying out the plans and works on the Shannon, to make some deviations not contemplated by the original plan, and which have turned out to be unprofitable?—The Act gave them power to do so.

419. But I am only asking you as a matter of fact, and not as to the Act?—I believe in most cases they acted under the instructions of the law advisers of the Crown.

420. I say that deviations from the original plan, which have turned out unprofitable, and which have incurred additional expense, have been made by order of the Treasury. You think that is undeniable?—They would not amount to a large sum of money if all that remains of them were brought to the hammer.

421. Mr. Lynam also says, that in many cases he thinks the drainage was sacrificed in favour of the navigation. Do you admit that?—I do not if the drainage is incidental to navigation, and if the interests of the navigation must be first attended to.

422. Then you admit the interests of the navigation were first attended to, and that drainage was reckoned a subsidiary thing, and therefore a great deal of the drainage originally contemplated was not carried out?—Yes, but I have already stated, so far as I understand Mr. Rhodes, the original drainage has been carried out.

423. Do you mean to state that all the drainage originally mentioned in the proposed works has been carried out?—I do.

424. You are thus directly contradicted by several other witnesses, and are directly at variance with Mr. Lynam's report, and also with Mr. Bateman's, and are at variance with the evidence they have given before the House of Lords, and the House of Commons?—I am giving evidence from my own observation, and from the knowledge that I have of the whole case.

425. Then you distinctly assert that all the drainage works contemplated in the original plans and estimates, have been carried out?—They have. That is from the passing of 5 & 6 Will. 4, down to the present time. I do not mean to take into account the period previously to that, because there was a different kind of drainage spoken of then.

426. Do you mean the Act of 1835?—No; as I stated before what I considered to be a full answer to that question is, that previously there were 32,000 acres of land seriously injured by inundations. Now there are only 20,000; 12,000 acres, therefore, have been relieved. I cannot find it stated anywhere that even that amount of relief would be given, because Mr. Rhodes only contemplated that instead of the lands being inundated for six or seven months in the year, they would be inundated for three, or four, or less.

427. But Mr. Lynam says, that the improvements so far made have been a failure, and that the cause of the failure is that a large portion of the excavations have not been executed. I suppose you admit that?—Yes; but I do not admit that such a drainage as that was ever promised.

428. But were not these drainage works that have been left unfinished delineated in the original plan?—The works were delineated in the original Parliamentary plan, but deviations were possible with the sanction of the Lords Commissioners of Her Majesty's Treasury.

429. And these works that have been delineated have been left undone?—They were left undone to the extent that I have already mentioned.

430.. But they have been left undone. Are you sure that the sanction of Her Majesty's Treasury was given in every case of deviation?—That is outside of my professional duties. As I said before, in one of the latter reports of the

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Commissioners to the Lords of the Treasury, they state that those alterations were made by the sanction of my Lords, and that I scarcely think they would have made that statement directly to their Lordships unless they did obtain their sanction.

431. Did the deviations affect the drainage more principally, or the navigation?—I think it cannot be said that they are more beneficial to one than the other. I think that they conferred a benefit upon both, or, to speak, perhaps, more correctly, on the combined measure of drainage and navigation.

432. And are you of opinion that all these deviations, in consequence of which a great number of the drainages originally contemplated on the Parliamentary plan have been left unfinished, have been positively beneficial?—As I stated once before, where a portion of work is left unfinished, I do not call that a deviation.

433. But portions of work have been left unfinished in consequence of the money having been exhausted by these deviations?—I believe that it was not so; it is in print. I gave in a paper on the subject, in which I stated the case fully, and I believe that what first originated the deviations was the inadequacy of Mr. Rhode's estimate to execute the works shown on the plans. Some of the most respectable contractors in the country estimated for the works in the first instance, at the time that we estimated for them, and on receipt of their estimates it was found that the money provided would not execute the works therein delineated, and that gave rise to the question, whether such a judicious deviation could not be made, as that the benefits might be secured, and the funds might meet the cost.

434. Have not the floods risen higher than they did before, in consequence of Killaloe weir being higher than was contemplated?—There is no doubt that any addition to the height of a weir must raise the water above it.

435. And has the additional height of Killaloe weir actually raised the water?—That cannot be denied, neither do we intend to deny a fact.

436. No doubt you have heard of the very disastrous effects produced by the floods of 1861; are you not of opinion that those effects would have been very much less disastrous if the works had been carried out as originally contemplated?—No; and I will tell you why. The weir delineated in what have been called the Parliamentary plans, was only designed to be 1,000 feet long; the weir as executed is 1,100 feet long; therefore, I conceive that that additional 100 feet is a compensation for the additional height that it was raised.

437. Are you able, from your experience, to pass any opinion upon Mr. Lynam's statement; he says, that if Killaloe weir had been no more than its proper height, the water would have been 9 to 12 inches under the surface of the land on which the crops were ruined by the flood of 1861?—I cannot agree with that statement.

438. Mr. Lynams has also made another statement; he says, at page 18 of a Report presented to the House of Commons in 1867, "The land remains still not cut away, the river channel is not widened, though the second channel is shut up by large embankments. One of these embankments is the sole cause of inundating every year one of the best fattening farms in Ireland." Have you paid attention to the facts alleged therein?—Yes; I know the place: it is near Meelick. But that channel spoken of there, across which the embankment was made, was excluded from the Parliamentary plans. There was no work to be done there. There was only to be one channel, and that channel was at Keelogue. I have already stated that the Keelogue channel is not executed to the full width.

439. Were those works to which I have referred part of the deviations sanctioned by the Treasury?—No, there is no deviation there.

440. But I thought you said they were not part of the original Parliamentary plan?—You will find in that same Report that, in answer to the Marquis of Clanricarde, Mr. Lynam spoke of a deviation. I said it was, in my opinion, not a deviation. He, the Marquis, admitted then it was an omission. There is a part of the work yet to be done there.

441. But I thought you distinctly admitted it was not part of the orignal Parliamentary plan?—There was only to be one channel, and to prevent the water going by any other channel, that embankment was put up to send all the water down by the western channel, the Keelogue channel. There is only one channel shown on the Parliamentary plan. There was no preparation to be made for the water passing by any other channel except that; indeed, Mr. Beardmore has given his opinion in his Report, that it would be much better to confine the river still to the channel, by giving it a somewhat greater capacity.

442. Then you admit it to have been an unauthorised work, if not a deviation; let us have no dispute about words?—The whole of the water was to have been turned down that channel.

443. But you admit it to have been made without the authority of Parliament or the Treasury?—I conceive they were carrying out the commands of Parliament, and the instructions of the Lords of the Treasury, when they followed the plan to send all the water down that channel.

444. But it is not marked in the plan; it is so stated in the Reports, and therefore the work was done on their own responsibility?—They could not keep the water in the channel unless they did so.

445. Was not this work done on their own responsibility excessively injurious to the neighbouring lands?—I think it was not done on their own responsibility, because it was done in obedience to the intention of the Legislature and the instructions of my Lords.

446. But it was not authorised by either, and was positively objected to in 1831?—I cannot tell about any objection being made to it in 1831; but it is not shown on the plans sanctioned by Parliament, nor am I aware of any instructions having been received from my Lords that the eastern channel should be opened.

447. Colonel *Vandeleur*.] Was it included in the contractor's estimate?—No; it is not in any estimate. The fact is, that, among all the papers, and they are very numerous, there is no such thing as a section of that channel.

448. Mr. *Pollard-Urquhart*.] It was not included in the contractors' estimates, nor ordered by the Treasury?—I do not think that any application

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application had ever been made to the Treasury regarding it; but, as I say, the plan was that the western, or Keelogne channel, should be the navigation and drainage channel.

449. Therefore it was not ordered by the Treasury?—No.

450. Will you not tell me plainly yes, or no; has it, or has it not, been injurious to the neighbouring lands?—On certain occasions, there is no doubt that it has been injurious to the lands. That I admit at once.

451. Is it, or is it not, injurious to the lands every year?—That I cannot say, from my own experience. I am there occasionally.

452. Has it appeared to be injurious whenever you were there?—Oh yes; I have seen it. I cannot tell, though, that the injury could be directly attributed to that, because I have seen it when the floods were over it. I believe that in the present state of that channel, those lands would be flooded, supposing that embankment was removed.

453. Did you hear it stated when you were there that the lands were decidedly in a worse condition every year in consequence?—I doubt that very much.

454. You did not hear it so stated?—No.

455. Has it appeared to be so whenever you were there; I think you admit that?—No, not always; I have been there when it was so, but I have been there when it was not so; I have been there and walked over it when they were cutting the hay.

456. With respect to the bridges, are you aware that Mr. Long stated, in answer to the question, "Would not the bridges that were in existence have lasted 150 years?" "They would have lasted a very long time, there can be no doubt"?—I dispute Mr. Long's opinion.

457. You disagree with it entirely?—I do, because I infer that Mr. Long spoke of the bridges as they were previously to the cutting away of the shoals underneath the bridges; but that they should be so durable after undersetting them four or five or six feet is another question. If they had not been disturbed they might have stood; I do not say they would not. Mr. Rhodes said, a few more winters would be most likely to carry them away.

458. Mr. *Ormsby Gore.*] Was not Mr. Long's answer, "Supposing that the shoals were not affected"?—I do not know; he does not mention it; I only infer it. I do not think Mr. Long could have given the evidence he did if he had taken into account the extensive alterations that were proposed to be made.

459. Mr. *Pollard-Urquhart.*] Mr. Long has said that in consequence of these new bridges, the works have cost 30,000 *l.* or 40,000 *l.* more than was intended. Do you agree with that?—My statement is directly contrary to that. I have been at a good deal of trouble in getting out the estimates of the cost of those bridges that Mr. Long mentioned. The estimated cost of the improvements and the underpinning was 18,823 *l.* 14 *s.* 5 *d.*

460. For all the bridges?—For the five bridges that were rebuilt, instead of being underset. The cost of the new bridges as constructed now was 16,942 *l.* 9 *s.*, showing a difference of 1,881 *l.* 5 *s.* 5 *d.*

461. Can you give me any cause of the discrepancy that appears between Mr. Long's answer and yours?—I am stating the facts.

462. But I thought you might have explained how the discrepancy originated?—Mr. Long's is only a matter of opinion. I would wish to remark that there is a mistake about the Tarmonbarry bridge. Only one half of that belongs to the navigation. There are two bridges with an island between them. The western or navigation is the largest, and belongs to the county of Roscommon now, except the swivel arch. The eastern bridge was not built by the Shannon Commissioners; it was built by grand jury presentment for the county of Longford, under Mr. Bell, their own county surveyor.

463. (*Chairman.*] Your evidence is, that the five bridges were built new for a less sum than it would have cost to underpin the old ones?—Yes, there are the figures.

464. Mr. *Pollard-Urquhart.*] Mr. Lynam, in his evidence before the House of Commons, in his answer to Question 491, says, that in some cases the works executed on the Shannon, actually depreciated the value of the land; and he gives several instances. Have you examined into the truth of that statement?—I stated before the Committee of the House of Lords, that I did not profess to be either a farmer or a valuator of land; therefore, professionally, I cannot give an opinion upon it; but I read in Mr. Nicholson's Report, that if drainage to a certain extent were carried out, there were some lands that from their quality would be depreciated in value.

465 Mr. *Ormsby Gore.*] Can you give me the length of Jamestown weir?—Seven hundred feet.

466. And what is the length of the Ruskey weir?—Seven hundred and forty-four feet.

467. Is it continually discharging at that length?—No.

468. Does that include the high level as well as the low level one?—It does; and the low level one is not level; in summer, when the water is low, it discharges only over the middle of it; it is dry at the two ends.

469. Was Mr. Kelly's evidence faulty, when he said the Jamestown weir was longer than that at Ruskey?—He only gave it as a matter of opinion; he said he had never measured it, I think; at least I understood it so.

470. You said there was some land below Ruskey weir that checked the outfall of the stream?—Yes; the water runs round the land, and there is a point of the bank of the river opposed to it. It would be well if it was cut away, but there are no funds.

471. Was that estimated for in the original plans?—This was a deviation.

472. An injurious deviation?—No.

473. It was an injurious deviation, in comparison with the plans that were first prepared, was it not?—It has never been proved so, for the simple reason that it is so close to the head weir. There are no lands about it. There is no question but that the head weir at Ruskey would be fully effective, only that it is backwatered from below.

474. Has the eel weir anything to do with that back-water?—No, I do not think it has; it is the water from Tarmonbarry that backwaters it.

475. That eel weir is in the same stream, is it not?—Yes; but it is immediately at the foot of the weir, and I have never known that eel weir of itself do any harm. I will not say that it did not to some extent, but I cannot understand that it has done much, because, I think, that

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that if it was fully exposed to the force of the water going over the weir at Ruskey in high floods, it would soon be carried away; but when the river below is back-watered from Tarmonbarry, then the force of the stream is checked.

476. Had the weir at Ruskey been placed where it was originally intended, which was at the mouth of Lough Bofin, would it have discharged the water any better?—No.

477. That is your opinion?—It would not, because there would have been a longer channel below the weir, and a weir will not discharge any better, unless the channel down stream of the weir has a larger capacity. If the channel is of the same size, which it was intended to be, it could not discharge any better. The weir will not operate unless there is a free discharge from it; and if you dam the water up below it, the discharge will be no better.

478. Then does not the eel weir below the present stone weir at Ruskey partially dam up the water below it?—As I said before, there does not appear to be any proof—any real proof that it does. That the floods have been injurious above the Ruskey weir has been in consequence of the water below back-watering the Ruskey head weir. If there had been a flood, without any backwater below Ruskey weir, then it would have been seen whether that eel weir acted injuriously or not; but having been back-watered below, it is hard to say whether it really acts injuriously or not.

479. Then, effectually to relieve the reach above Ruskey, you must lower the weir at Tarmonbarry?—There must be provision made to allow the water to pass with more facility.

480. Do you know how much below the level of Ruskey the top of the weir at Tarmonbarry is?—About 3 ft. 4 in.

481. Mr. *Bonham-Carter.*] In how many miles?—The rise to Ruskey is about 3 ft. 4 in.

482. But in how many miles?—It is about 7½, or from 8 to 10 miles. I really do not at present recollect the exact distance by the river.

483. Mr. *Ormsby Gore.*] In what year were the works of the Shannon completed?—In 1850 the last Report was presented; in 1849 the works were completed.

484. Since then has there been any improvement in the outfall?—None.

485. Since 1850 have there been any arterial drainage works carried out?—Yes.

486. Having their outfall into the Shannon?—Yes.

487. In consequence of those works, does not the water come down more rapidly into the bed of the Shannon?—Experience shows us that there has been very little increase, if any at all; in fact, in one instance which I worked out, and which I gave in evidence before the Committee of the House of Lords, the water is now lower since the arterial drainage has been completed than it was before.

488. Do you compare the condition with 1850, or with the state of the Shannon before the works were begun?—Up to the year 1853, and then up to the year 1861; this reach is considered to be the most important one on the Shannon. It is the reach from Killaloe to Athlone, and I took the highest floods. In the year 1847, it was 9 ft. 10 in.; in the year 1848, 9 ft. 10 in.; in 1849, it was 9 ft. 3 in.; in 1850, it was 9 ft. 5 in.; in 1851, it was 9 ft. 8 in.; in 1852, it was 10 ft. 6 in.; in 1853, it was 10 ft. 4 in.; that is over the upper sill of Killaloe Lock. It was in 1853, that the Special Commission on Drainage completed their report, on which an Act of Parliament was founded for the completion of the drainage districts. At that time, in the winter of 1852 and 1853, all the meadows, the callows, as they were called, were covered with water. Then if we take the years after that, when the outfalls of those districts were opened up, and brought into the state they are in now, we find the readings to be these: in 1855, the height was 8 ft. 10 in.; in 1856, 9 ft. 3 in.; in 1857, there is no return; in 1858, it was 9 ft.; in 1859, it was 9 ft. 2 in.; in 1860, 9 ft. 8 in.; and in 1861, 9 ft. 4 in.

489. What date do you take in those particular years?—The highest floods.

490. Then the highest flood in 1861, was only 9 ft. 4 in.?—Nine feet 4 in.; and in 1853, it was 10 ft. 4 in.; and in 1852, 10 ft. 6 in.

491. That has been called an unprecedented flood?—The flood in 1861 was a very high flood.

492. It has been called an unprecedented flood?—It was not so high as the flood of 1852 and 1853; that was 10 ft. 6 in.; and in 1861, the height was only 9 ft. 4 in.

493. The River Brosna, has its fall in that reach of the river?—It has.

494. And arterial drainage has taken place there?—Just so.

495. Does not that bring the water down more rapidly than it came before?—It is just as I say. In 1853 the outfall of that district was not opened up. I was at the place along with the Commission of special inquiry, and saw the whole of the meadows under water from side to side. In 1855 it was opened, and so on to 1861; and yet the readings then were lower than they were previously.

496. You state that the outfall of the Shannon itself has not increased?—Yes.

497. How do you account for that?—I am reading these records to show that the quantity of water at Killaloe has not increased in consequence of the arterial drainage opening into it.

498. What becomes of the water?—That is a question that is not so easily answered. I am reading the gauges for several years previous to the opening of the outfalls of the drainage districts into the Shannon.

499. I am asking you for facts?—These are facts.

500. But I must ask to be allowed to doubt those facts; I do not believe those gauges?—We must receive them as facts until they are properly contradicted. Those persons who give the readings have no other source of obtaining them except the records at the lock houses.

501. I ask you whether the outfall of the Shannon has increased since 1850; and you tell me it has not. But, since that time, you tell me the influx of the river has increased in consequence of the arterial drainage?—No.

502. You did not say that?—No.

503. Then what is the object of arterial drainage?—The object of arterial drainage is to carry off the water without injury.

504. It is to carry it off more rapidly, is it not?—No.

505. Will you answer that question; is it to carry off the water more rapidly than it otherwise would be carried off?—That requires some explanation. From my long experience in drainage works, I know this, that when the flood be-

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gan to rise in those districts, it did not flow so rapidly for a short time. It depended upon the character of the valley in which the drainage was; but when it had accumulated until the obstructions were overcome, then the whole of the water came down, and the quantity then was as great, if not greater, than it is now. Since the rivers have been opened up, the moment the flood water begins to arrive at the channel, it passes away, and this increasing discharge goes on regularly until the height of the flood is attained; but then there is no more water than there was in the previous instance. If we take into account the improvement of the land, we have reason to believe the quantity of water is not so great.

506. The quantity of water is not greater, but the discharge is more rapid; is not that the case?—It is a question of time. In the first instance, the flood did not flow so quickly into the river; but as soon as it had surmounted all the obstructions, then it came in its full quantity. When the river is improved, it flows from the very commencement as soon as ever it arrives in the river. A large proportion of the rain that has fallen goes off before the flood gets to its height, and it never rises so high.

507. Not in the river itself?—No.

508. But it does in the receptacle?—No; it can carry no more than the greatest quantity that is delivered from the rainfall, and I say that is attained in the first instance in the unimproved state of the district more slowly than the other; but it arrives at it in a given time, so that you have the whole quantity of the water to deal with in both cases; indeed I may say you bad more in the unimproved state of the country, because it was so saturated with wet, and the soil is so unretentive, that more water was delivered from it in a given time than after those lands have been broken up and improved.

509. Do you mean that the water that falls upon the ground by rain, is more equally and regularly delivered to the drainage than it would go off in the undrained state of the country?—Just so; there is a certain quantity of water ponded up in the unimproved state of the river, but it does not require a long time to fill those places up, and then the whole of the rain comes down, and there is a larger quantity of water delivered into the channel, because the land is already saturated. When the land is broken up and ameliorated it absorbs a large quantity of rain, and it delivers it more equally and more slowly; the improved channel carries it away then gradually as it rises, so that there is never such a great quantity delivered, in my opinion, in the same time; our experience goes in that direction, and we have been close observers of it for a long time.

510. Take your own phrase; suppose there were a weir, and the water were "ponded up," we will say for a fortnight, the quantity of water delivered ultimately, would be delivered as soon as it reached the top of the weir, instead of being delivered during a number of consecutive days; putting the case of an artificial obstruction to water, such as a weir, you would still have to deliver the same quantity of water, but in that case you would deliver it in a very short time?—Yes, but I do not think that the instances are parallel. When it comes to the discharging line of the weir there is no obstruction, the water falls over it at once; but it is very different when for ten, twenty, thirty, or fifty miles of unimproved, and there is a long obstructed river channel, and even in an improved channel it is a question of time, because the water has to travel from one end to the other of it.

511. There is a proposal to make some of these loughs reservoirs?—Yes.

512. Surely, if those loughs were made reservoirs there would be a retention of the water for a very long time till it reached the height; but after all, the water would have to be delivered in some way or other?—Just so, we have made use of loughs as ponds, and the principle is under consideration with reference to other cases of the same kind.

513. An undrained state of the country is something similar to an artificial obstruction?—It is; but the first thing we have to consider in a case of that kind is, what proportion does the area of those lakes bear to their rain basin, and how much would the surface of those lakes be raised by a given quantity of rain in a given time? When we find that the areas of the lakes are very small in proportion to the area of their rain basin, then the ponding system is of little or no avail. If the area of the lakes comes up to something like nearly one-twelfth or one-fourteenth of the area of the rain basin, then the waters are more controlled artificially than they were in the natural state, because in the natural state there is just so much ponding, as the water rises there is nothing to prevent its escape; when we make use of it artificially, we put in works that measure the quantity going out, and only a certain quantity can be delivered out in a given time. Of course, we do not say they will be completely effectual under all circumstances; because, when certain excessive floods come, we have no preparation for them, and when they do come, to a certain extent, our ponding system is not effective, because we have not in practice considered it advisable to make preparation for floods that come only once in 10, 15, or 20 years, but only for ordinary floods.

514. Do not those large loughs, Lough Derg, Lough Ree, Lough Bofin, and Lough Bodarrig, act as natural reservoirs?—They do to a certain extent, but there have been no works executed to pond up more in them than the rise at the weir will give.

515. What the rise of the weir will give?—What the ordinary rise at the weir will give. Of course the expanse of the lake is much greater than the area of the river in the same length, because Lough Derg is 23 miles long, and from four to five miles wide; perhaps four miles on an average. An equal length of 23 miles of the river would be very different, because probably taking the river there on an average it is not more than 300 or 400 feet wide, and therefore the quantity of water retained in the lough is proportionately greater than it would be in the same length of the river: but to have made use of Lough Derg artificially as a pond the outfall must have been greatly deepened, and some preparation must have been made to pile up double the quantity to be delivered out slowly; and that is not according to the original plans or the system adopted.

516. Mr. *Gregory.*] You stated that there was no original estimate for the drainage; was it not generally understood that extensive drainage would have been effected by the very works which were intended for navigation?—It was.

517. Was

517. Was not drainage as well as navigation contemplated in that very Act to which you have referred, and with which I have no doubt you are conversant, the Act 5 & 6 Will. 4?—It was. There are two kinds of drainage mentioned in it. One is the general drainage resulting incidentally from the works of the navigation, and there is a drainage spoken of by which peculiar benefit would be conferred upon certain portions of the lands.

518. And have not both those objects been alluded to distinctly in what I may call the second series of the Reports of the Commissioners, from No. 1 to No 11?—It has all been alluded to, but no further than what is stated in the last report. The quantity is given there (18,750 acres, I think it is) as having been relieved. It is called "drainage to a great extent," in some places; "drainage in a considerable measure," and such expressions as those. There is nothing definite given.

519. If you had been constructing works purely for the purposes of drainage, I presume one of the first steps that would have been taken would have been to deepen the channel?—Yes.

520. And naturally also, I presume, one of the very first steps you would take for the navigation would be to deepen the channel?—To both deepen and widen it.

521. Therefore the works that were intended for navigation may also very fairly be considered to have been also intended for drainage?—Yes, as a combined measure, which this was.

522. You have stated that Mr. Rhodes, in his report, has mentioned that those lands to which you have alluded would not be flooded more than eight months in the year?—Not more than three or four months.

523. Was that the exact expression which Mr. Rhodes employed?—Yes.

524. Did he mention the time of three months?—Three or four months, or less.

525. That was his expression?—Yes.

526. You have also stated that 32,000 acres of land were flooded before the completion of these works?—So it is stated in Mr. Nicholson's report.

527. Do you know upon what authority that rests?—It rests upon the same authority as all the inquiry rested on the authority of the parties employed to examine those lands.

528. Then there are actual statistics to prove that 32,000 acres of land were flooded before those works were completed?—The lands on the lower part, or what is called the Middle Shannon, Mr. Nicholson examined and valued in detail, and reported their quality, and he ascertained that they would be improved. He also delivered maps, showing where those lands were, and the period of time during which they were flooded. If I recollect rightly, there were three periods given of the duration of the inundation. The area of the flooded lands was ascertained on the reach above, on the Upper Shannon; but there was no valuation made there, because from the conclusions Mr. Nicholson had come to with respect to the Middle Shannon they abandoned all idea of conferring any peculiar benefit upon the lands. Therefore they did not go to the expense of prosecuting the valuation any further. Mr. Nicholson's valuation amounted, on the average, to 2*s.* 3½*d.* per acre, and supposing that had been capitalised and applied to the enlargement of the river, so as to secure the drainage of those lands, it could not have been done.

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529. How many acres did Mr. Nicholson calculate would be relieved by these works?—Sixteen thousand acres I believe was Mr. Nicholson's quantity. The quantity on both the reaches is nearly about the same.

530. Do you think an improved drainage of the River Shannon would be incompatible with the navigation?—I do not. I believe that they can both be carried out very efficiently.

531. Will you point out to the Committee in what manner you would obtain that improvement of the drainage which would not interfere with the navigation?—By enlarging the channels. I am not prepared to state any plan. I was in a measure associated with Mr. Bateman on his first visit to the Shannon, but on his second visit I was not deputed to attend him, because the Board thought it was proper that he should be allowed to do the work himself, and that I should have no connection with him. So that I would be able to assist them in the examnaition of any plan that might be proposed for adoption.

532. When you speak of deepening the channels, do you refer to channels that have not been made as wide as the original estimate?—They would require much more extensive improvement than that. When I say enlarging the channels, I do not mean that I would enlarge them by deepening them. I would enlarge them much more in breadth.

533. By cutting?—Enlargement in the width can be done for a much smaller sum than deepening, and would be equally effective.

534. You have only mentioned, I think, that some of the shoals were not deepened, as they were orignally intended, according to your first plans?—I am not aware of any.

535. Did you not say so in your evidence a few minutes ago?—I think not.

536. That the money was expended, but the shoals were not deepened, as originally intended?—They were not increased to the full breadth intended.

537. Mr. *Ormsby Gore.*] But will not that apply to the depth of Killaloe?—There are some remains of dams, I believe, at Killaloe yet, that have not been dredged out. I am not aware that there is any more of the work remaining at Killaloe, except the dredging out of those dams.

538. Mr. *Gregory.*] You think the drainage might be effected without injury to the navigation by widening the channels?—Just so.

539. Do you not think that it might also be effected by means of a more elastic system of letting out the waters than the present solid weirs?—I have no objection to answer the question generally, but I decline to go into detail, as I would then be anticipating the decision of the Board.

540. If you think there is any objection to your answering the question, do not answer it; do you not think the regulation might be improved by means of regulating weirs?—I am decidedly of that opinion; but I must state when I make that admission that a change in the dams would not be attended with the anticipated effect unless you made the channel sufficient to bring the water to them.

541. Sir *Graham Montgomery.*] On the whole your opinion is that this work has been a great success?

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success ?—I would not put the superlative degree to it; I would say that it has been effective.

542. Effective so far as it goes, and your opinion is that drainage on the whole has rather been a secondary consideration to the navigation all through the business ?—Decidedly so.

543. Am I right in describing it as rather an incidental consideration ? — Incidental to the works for navigation.

544. And the improvement of the navigation of the Shannon was the main object you looked at in the works ?—That was the main object.

545. For improving the local trade and traffic of the district ?—Yes, that was the primary intention; I am sorry to say it has not been realised.

546. Colonel *Vandeleur*.] In the instructions given to Mr. Rhodes in 1831, which I have no doubt you have heard, it is stated, "It is evident that the great key of any system of drainage must be the falls of Killaloe" ?—Yes.

547. If therefore those instructions were given to Mr. Rhodes by Colonel Burgoyne, would you not say that was an intimation in 1831, that drainage was to be looked to as well as navigation, that drainage and navigation were in fact to be combined ?—Drainage and navigation were combined, and as a combined measure I answer the question in the affirmative, but I do not say that it was to be done for any particular drainage or for drainage alone, any more than to fulfil Mr. Rhodes' idea of keeping down the inundation as much as possible, to serve his navigation.

548. At Meelick there is a considerable fall ? —Eight feet.

549. Has that fall been increased or decreased since the new works; is the water stopped up to the same level as it was before ?—The same level.

550. The water is at the same level at Meelick as it was before the present works were improved or increased ?—Just so.

551. Therefore there has been no reduction of the fall at Meelick ?—No reduction; the Hamilton Lock remains the same as it ever was, to prove what it is.

552. Therefore the drawing at Meelick on the great flat that lies between Meelick and Athlone was not improved ?—That consequence does not follow.

553. Would not that be the case if the level is the same as it was before the new Victoria Lock was made there ?—There has been a very large quantity of excavation there; there have been a number of eel weirs taken away. In fact the navigation of the old canal had no weir to keep it up; it was kept up solely by the shoal and eel weirs. That has been all removed, and there has been given a very much increased capacity in the channel approaching the head weir, to allow the water to escape.

554. But Mr. Bateman, in his Report, rather says the contrary; that half the channel that was intended to be cut away was not cut away ? —Oh, no.

555. He says that the excavation was not made ?—Mr. Bateman's object of pursuit was different. His was a plan for the perfect drainage of the lands. He certainly states that the eastern channel was not improved, which is the fact; but, as I have stated over and over again, the Parliamentary plans, as they have been called, did not anticipate doing any work at all in that channel. All the water was to be discharged by the Keelogue channel, the western channel. Mr. Bateman, no doubt, takes advantage of the other channel to a certain extent, to get rid of the surplus water.

556. But is it not stated both in Mr. Bateman's report and in Mr. Lynam's, that the work as contemplated was not made at Meelick; that is, that only half the contemplated channel was opened at the same time that the safety valve between the islands was shut up ?—That may be called a safety valve now, but it was not a safety valve then, because the other channel was then very much obstructed, and the discharge was not then equal in both channels to what it is in the one now; but I have admitted over and over again that at the Old Round Fort there is a quantity of excavation on the eastern side that remains to be done. It is stated in several of these Reports, and also in a communication to the proprietors of the lands about the year 1853, that there was a quantity of excavation to be done there, and that as soon as funds were available it would be done.

557. That land was purchased and paid for? —Yes.

558. Was that included in the contractors' estimate ?—The land ?

559. Deepening that channel ?—The contractor got an advance upon the prices that he had because he could not excavate the shoal; for instead of its being loose gravel or clay that can be worked in the ordinary way, with pick and shovel, he had to blast it with gunpowder.

560. When the contractor took these different works, the works for instance about Meelick, was it for a lump sum, or by the yard ?—Each contract was for a lump sum, but that lump sum was capable of modification by the schedule of prices which he delivered in with it; so that if either a lesser or a greater quantity of work was done than was included in the lump sum, there was a deduction or addition.

561. But just bring it to your recollection. Was there any single work along there done for the original estimate ?—Each of the works exceeded it.

562. Take Athlone ?—Each of those works, that is each of those large works, exceeded the estimate. Some of the smaller works did not, but all the large works did.

563. And that made the great deficiency in the money which afterwards took place, in consequence of which the works were not completed ? —The peculiar system was this, that a certain sum of money was provided in the estimates for certain places, such as Killaloe, and Meelick, and Athlone, and as there was no expectation of any further funds, the works at those places were confined, as near as it could be done, in the expenditure to the sum provided.

564. But at Killaloe the money was provided to meet the expenditure according to Mr. Rhode's estimate ?—Mr. Rhodes' estimate was deficient.

565. At Killaloe it was deficient too?— Yes.

566. Because there you see a hundred feet on the Tipperary side remains that was not cut away ?—Oh, no; the weir is a hundred feet longer than provided for.

567. I am not talking of the weir but of the channel under the weir. The channel at Killaloe has not been completed, either to the depth or the

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the breadth indicated on the Parliamentary plans?—I think it is, fully.

568. It appears that the contractors had lump agreements for all these works, and in no instance were the works done for the money?—As I said, in every case, although there was a lump sum, that lump sum was capable of modification by a schedule of detailed prices.

569. This point, I believe, arises then. The Government undertook the works through their officers, and on the other side the counties expected value. Was not that the case?—I do not apprehend you.

570. When the Shannon works were undertaken there was a certain portion of the money to be paid and levied on the counties?—Yes.

571. The Government by their officers carried out the works; the counties had to pay, and the Government contract was never fulfilled because the works were never completed?—I cannot see it in that light.

572. You have a good deal to say at the Board of Works?—Yes.

573. Can you tell the Committee how many arterial drainage works, that is, the river drainage works, exceeded the estimate?—Out of, I suppose, 103 or 104, there were not above two that did not exceed the estimate.

574. Pray, who made those estimates?—They were made by a variety of persons.

575. But in whose employment were they?—They were approved of, of course, by the Drainage Commissioners.

576. Who paid the difference afterwards?—In some places the proprietors did; in other places, where there were peculiar circumstances connected with the case, by the drainage works being turned into relief works, there was a remission of money made by the Government.

577. *Chairman.*] What do you mean by remission?—"Remit" is of course a plain English word, and we know the meaning of that, but you mean as applied to this case. An account of the whole cost of the drainage work was made; but in consideration of the work having been made use of under the direction of the Government as a work of relief, and being carried on in a way that was not consistent with strict economy, for the purpose of employing the largest number of persons, they remitted out of that amount a certain sum; that is, they did not charge it.

578. Colonel *Vandeleur.*] The estimate contemplated the complete finishing of the works?—The peculiar circumstances of the country changed.

579. I ask you the question whether they did or not?—Well, it would require to understand first, how those estimates were made. There is an Act called the Summary Proceedings Act; under that Act any survey in existence, or any survey made in the least period of time, might be adopted, so that these summary proceedings might be completed to get the men put to work, and surveys and estimates made up in that hurried manner we know are not much to be depended upon. It was that which led to the appointment of the Commission of Special Inquiry, in the end. Because these surveys being so hurried, there was a limit put to the expenditure in the Act, that it should not exceed 3 *l.* per acre until the whole case was brought again in a proper form before the proprietors, so that they might again assent.

580. *Chairman.*] When you talk of a remission of the portion of the money expended over 3 *l.* an acre, do you allude to the decision of the House of Lords, that that money was not properly expended, and that the parties should not be held liable for it?—Oh, no, I do not view it in that light. The drainage works were works undertaken for the benefit of private individuals. In fact, the Board became contractors to execute the works on behalf of the drainage proprietors. It was not the original intention that it should be so, but it resulted in that on account of the large sums of money advanced by the Government. The press that there was for employment during the time of relief was very great in all parts; the Board of Works down to the meanest official were pressed hard to employ the largest possible number of men. But when all this excitement was over, the proprietors made a complaint that the works executed for their special benefit should be converted into a public accommodation, and they should be made to pay for it. It was in consequence of that the Government came to the conclusion, on the recommendation of the Commission of Inquiry, to remit certain sums where there was reason to believe that those works had cost a great deal more than if they had been allowed to be carried out slowly and economically, as they were originally intended to be.

581. Were not the private individuals for whose benefit these works were undertaken to pay the entire cost?—They undertook to do so when they gave their assents in the first instance; they undertook to pay the cost of the works according to an estimate that was laid before them.

582. Even the cost of the preliminary inquiry before the estimate was made was to be borne by those proprietors?—It was.

583. The result of those works being undertaken under the superintendence of the Board of Works was, that out of 104 cases, two only were completed within the Commissioners' estimates?—There may have been others completed for the estimates, but I cannot at present think of them.

584. However, a second assent has almost universally been claimed for an additional expenditure?—There were cases in which there were no second assents, or "assenting again," which is the term in the Act. All districts undertaken under the ordinary proceedings did not require them to assent again; it was only those undertaken under the Summary Proceedings Act that required such celerity in the getting up of the preliminary papers. It was required that a revised estimate, and so forth, should be laid before them, so that they might again assent.

585. You say there was a great demand from every side on the Board of Works to undertake arterial drainages?—There was.

586. That was partly owing to the circumstances of the country in the failure of the potatoe?—Just so; and on that account the remission was made.

587. But it was also prior to the Irish proprietors discovering the mismanagement of the expenditure on the Shannon?—I was engaged along with the Special Commission all the time, both in Ireland and in London, and I am not aware that in any of their reports, or in any of the papers, that they put forward when they came to examine into the cases brought under their consideration, there was either mismanagement or excessive expenditure reported.

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588. In the Shannon?—No, in the drainage: we are talking of the drainage works now.

589. The decision of the Lords was, that a considerable portion of the money claimed should be struck off?—It was the recommendation of the Commission of Special Inquiry that those 11 districts which were handed over to them to inquire into should be finished at the public expense, no matter what it cost, and then on a re-valuation of the lands, a fair assessment should be made for the actual benefit conferred.

590. That is, as it worked out, the decision of the Lords was, that a certain sum of money should not be claimed on account of there being no return from it?—I beg pardon; this was not a decision of the House of Lords.

591. Well, of the Commission?—When the report of the Special Commission was presented to the House of Commons, an Act was brought in, which passed, in the first place, the House of Commons in the usual way, affirming the principle that had been laid down, and also giving power and authority to the Lords Commissioners of the Treasury to remit certain sums to districts that were finished, and awards made, because on inquiry, it was found that if this privilege was extended to the 11 districts, that other districts were under similar circumstances, and although they had not refused to assent again and have the works finished, they were entitled to some consideration.

592. The recommendation of the House of Lords was being carried out under the cover of that Commission of Inquiry?—I beg your pardon; the House of Lords were not competent to issue orders in this case.

593. They recommended it?—The recommendation came from the Commission of Special Inquiry.

594. And the Lords too?—And upon their Report the Act was confirmed.

595. The first thing was the Report of the Lords that the money had not been properly expended?—That is what is generally called Lord Ross's Committee, but that is their opinion.

596. And that the Commissioners did not carry them out to the full extent?—The Commissioners had no power to do so. It was the Lords of the Treasury who obtained power by that Act, to make such remissions as they thought proper.

597. Mr. *Pollard-Urquhart*] You said that in almost all the instances, say a hundred and two out of the hundred and four of arterial drainage that you have known carried out, the expenses have exceeded the estimates. Have they exceeded the estimates in any other cases except when men were employed for the sake of charity?—Yes; there was one special cause of excess in those estimates. When the surveys for those districts were first made, they entertained very moderate views of thorough drainage. The minor drains were seldom put more than 20 inches under the surface, or from that to two feet, and the sub-mains about three feet, and so on; but Mr. Parke came over to Dublin and brought an entirely new system of thorough drainage in which the minor drains should be at least from four to four and a half feet under the surface, and the sub-mains from five to six feet. Now the surface of the water in the proposed new channels would not admit of such a drainage as that; consequently the channels had to be increased in depth, and I suppose that in the majority of cases that increased depth was in rock.

598. But, nevertheless, that circumstance would not have caused the not carrying out the works, especially supposing the exact depths to which the channels were to be cut were properly specified at first. It might have been necessary to excavate them more, but the discovery of Mr. Parke would not have affected the carrying out the works?—I remember one instance; in a district in the county of Tipperary, a gentleman had obtained some money under the Land Improvement Act to thorough drain his land. When he went out to look at it, he found that the flood water was within two feet of the surface of the land. He immediately wrote to the Commission to say that, in consequence of this imperfect drainage, he could not make use of the money, nor carry his thorough drainage into effect, and calling upon them to remedy this defect, so that he might have an outfall for his thorough drainage.

599. As I said before, that might make certain proposed works not so beneficial as might have been expected, but it could have been no cause whatever for the expense of the proposed works exceeding the estimates, if they had been done in the manner specified?—I cannot, at present, go into that. It not bearing upon this particular examination, I am not prepared.

600. Have remissions ever been made in consequence of the expense exceeding the estimate, in other cases than when labour was employed in the way of charity?—Not that I am aware.

601. Do you state that distinctly?—So far as my knowledge extends, and I think I know the first and last of it all.

602. Mr. *Bonham-Carter.*] Were you in that official position which would render it in the usual course that you should be consulted about the remission?—No; that is a question for the Board and their law advisers.

603. So that the opinion you have been expressing about the remissions is from matters which came under your observation from the general knowledge you had of the drainage, and not from being actually officially consulted about these remissions?—Just so; it was outside of my profession.

604. You were asked whether the Government had carried out a contract with the proprietors. Are you in a position yourself to give an opinion as to how far there was a contract with the Government and the landed proprietors with regard to the terms for the improvement of the Shannon. Does it come within your professional position?—The Government and the proprietors? Such a course is not recognised in any of the documents belonging to the Shannon, that I know of.

605. You have been asked in reference to what in the question is implied to be a contract; had you anything to do yourself with making a contract on the part of the Government officially?—Oh, no.

606. So that you do not consider yourself officially competent to express an opinion whether that is a distinct contract between the Government and the proprietors, or not?—I can only simply state my own opinion as a private individual.

607. You have been asked a question with regard to certain deviations, and whether the effect of those deviations was not to reduce the amount of money available for certain works in the higher part of the Shannon; do I understand you to say that although certain deviations were made,

those

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those deviations were on the whole economically made?—They were. I have stated that the origin of those deviations was the inadequacy of the amount provided in the estimate to execute the works that were shown on the plans; and then they tried to devise other plans that would be equally beneficial and that would cost less money.

608. So that in fact the general result of the deviations as intended was to set the money free for the upper part of the Shannon instead of reducing it?—It was to leave the estimate for the Upper Shannon untouched.

609. Mr. *Pollard-Urquhart.*] But, in fact, it did not do so; it absorbed the money instead?—No; the works in the Upper Shannon show the same excess in their execution as the works on the Lower Shannon.

610. Mr. *Bonham-Carter.*] Am I right in supposing that in order to these deviations, certain approaches, for instance, of an island, which were to be removed, were afterwards abandoned, with a view, on the whole, to economy?—I could not at present state the extent of any property that may have been taken for these deviations; but the impression on my mind at present is, that especially at Tarmanbarry or Cloonduah, the area of land for that large side-cut that is shown on the original plan was not required, and that of itself would more than compensate for any little corners that might be required for any others; but I am really not aware that they did not require any.

Thursday, 7th May 1868.

MEMBERS PRESENT:

Mr. Sclater-Booth.
Mr. Bonham-Carter.
Mr. Agar-Ellis.
Colonel French.
Mr. W. Ormsby Gore.
Mr. Gregory.
Mr. Laird.
Sir Graham Montgomery.
Mr. Pollard-Urquhart.
Colonel Vandeleur.

COLONEL FRENCH IN THE CHAIR.

Mr. JAMES S. PENNY, called in; and Examined.

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611. *Chairman.*] ARE you a Civil Engineer?—Yes.

612. Have you been employed on the Shannon either in the execution of the works or since they were closed?—I have not been employed on it, but I have reported on the effect of the floods.

613. Mr. *Sclater-Booth.*] You have had considerable experience in land and engineering surveys?—I have.

614. How long is it since you entered the service of the Board of Works?—In 1846; about 22 since.

615. Were you instructed by the Board of Works in August 1865 to inspect the reaches of the Shannon, and to ascertain the levels of the water?—I was.

616. Have records been kept of the height of the water at the several locks?—Yes.

617. Originally by the Shannon Commissioners, and afterwards by the Commissioners of Public Works?—Yes.

618. You ascertained, I believe, the relative levels between the former and the present lock sills?—I did.

619. And the weirs?—And the weirs.

620. Have you also ascertained the height to which the lands came under the influence of the floods?—I have.

621. Before and since the works were executed?—Yes.

622. Many of them, I believe, you have tested by personal examination?—I have, and by levelling.

623. And in all cases by the lock registers?—Yes.

624. From the information you have obtained, have you been able to compute certain tables which have already been placed before the Committee?—I have.

625. It has been stated in evidence by Mr. Kelly that he had no faith in the accuracy of these registries; have you had opportunities of testing their accuracy?—I have.

626. And have you found on all occasions the heights accurate, as set forth in the table?—I have.

627. What is the practice as to the daily registration?—The heights of water are registered daily at 12 o'clock; and then, at the end of each week, a return of those heights is sent to the Secretary of the Board of Works.

628. From each station?—From each station.

629. You have been up and down the river, as we have heard, within the last two years, or since 1865?—In 1865, and early in 1866.

630. It has been stated that, in regard to the discharge of the flooded lands, there has been no effectual improvement, but that, on the contrary, injury has been done by the works of the navigation; what opinion have you upon that point?—I consider that much improvement has been effected.

631. Do you consider that the tables you have put in will substantiate that opinion?—I do.

632. That is your general statement as to the whole of the river?—It is.

633. Will you apply your memory more particularly to the Ruskey Reach; it has been stated that the water was 12 or 13 inches higher there than before the commencement of the operations of the Shannon Commissioners; is that the fact?—I have not found it to be so.

634. Have you any plan or diagram showing that it is not so?—The greatest flood before the works were executed was in 1836; the water rose six inches higher than it did in the extraordinary winter flood of 1852 and 1853, which was the highest after the completion of the works; but the height of the water, generally speaking, is much lower. I will illustrate that by a diagram which I have here. This is a diagram showing the heights of the water for the year 1836. At least, it is only for 11 months. The register was only kept for 11 months of that year, and that is shown in blue. The red shows the extraordinary flood of 1853. Each of these broad parallel lines is a foot apart.

635. That is taking the greatest flood that has occurred since the execution of the works, and the greatest flood that you know of that has occurred since?—Yes. There are some corrections to be made in the diagram, in consequence of the fall which exists in the surface of the water, between the head of the old canal and the new lock, but it represents the heights as recorded, from the readings of the gauge at the new lock upper sill. (*The diagram was handed in,* vide *Appendix.*)

636. Mr. *Bonham-Carter.*] Can you tell me how many days that flood continued?—The diagram will show it.

637. Is there any record of the quantity of rain that fell in the district at that time?—In Mr.

Bateman's

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Bateman's report it is stated, but not for 1836. The quantity of rain that fell in January 1853 was, at Galway, 7·9 inches, and at Sligo, 6·13.

638. Mr. *Sclater-Booth.*] It has been stated that the summer water is 1 ft. 3 in. higher now than before the works were commenced; do your records show that to be the fact or not?—They do not; and perhaps it is as well here to state at what the original summer level was fixed for Rooskey. Taking the lowest summer water in each of the summer months for a number of years before the works were commenced, the lowest water (I may call it an extraordinary low summer level) was 4 ft. 5 in., and the heights varied from that up to 5 ft. 8 in. The level adopted by the Shannon Commissioners was 4 ft. 6 in. as the navigation level, and that is the summer level at present.

639. It has also been stated that the bridge which was built by the Commissioners at Carnadoe has a less waterway than the one they pulled down; is that so or not?—It has not, and I can illustrate it by diagram if the Committee wish.

640. Will you produce it?—This plan shows the old arches, which the Committee will see marked in black; the dark blue, the former water way. The present bridge is represented in red, and its water way by a light blue tint. I have marked in the corner the superficial areas of the channels respectively.

641. It has been said that the Ruskey weir is set too high by nine inches, and that the lakes have lost, in consequence, nine inches in height of their pounding power?—They have not; there is a difference. The summer water is now about one foot lower than it was previous to the execution of the works, and consequently an increase in their pounding power to that depth.

642. Mr. *Ormsby Gore.*] Is that the highest level wall of the weir (*pointing on the plan*)?—Yes, the weir which regulates the navigation canal.

643. There are two levels on the weir?—I take it that the weir, at least the regulating weir, is at the level of the extraordinary low summer water before the works were executed.

644. Do you call the regulating weir the upper level weir, or the lower level weir?—There is only one weir.

645. There are two?—I speak now of the weir that regulates the navigation.

646. Mr. *Sclater-Booth.*] There is a certain new line of road from Ruskey to Kilgloss that runs along the verge of the lake. That was laid out at a level above the level of the floods previously known, but it has been stated that since the dam (or the weir I suppose) at Ruskey was full up, the road has been constantly under water. What is the real state of the case?—I have taken the relative levels of the road and the old lock sill at Rooskey, and have made a section of the road, and transferred the highest flood before the works on to it. It is represented by the line at the top of the yellow tint. In order to escape the floods before the works were executed, it should have been made above that line, or two feet higher level than it is at the place referred to.

647. You mean that if it had been intended to have been a complete bar to the floods above that height, the road should have been above the top of that yellow line?—It should. The bottom of the road is so low at present that, whenever the winter flood is a little above the usual, it is certain to be flooded.

648. Colonel *Vandeleur.*] It has been left then pretty much in the same state as before?—This road has been made since the works were executed.

649. But the road was flooded before and is flooded still. I understand you to say that whenever there was a flood the road was covered?—The road was not constructed by the Commissioners, but by the county. The road was made on too low a level altogether.

650. Mr. *Sclater-Booth.*] It was never constructed at such a level as to render the Commissioners open to the imputation of causing the floods to rise higher than was contemplated when the works were constructed.

651. Mr. *Ormsby Gore.*] Which is the road you are speaking of?—The road from Carnadore Bridge to the village of Kilglass.

652. Mr. *Sclater-Booth.*] It is said that the mill-wheel at the Grange is now embarrassed with back water, and was never known to have been so embarrassed before the execution of the works?—I have made a section of that mill wheel, and I have fixed the level of the summer water. I have transferred the different levels of the water, showing the various heights of the summer and winter water before the execution of the works, and again since their completion.

653. We come now to the Tarmonbarry reach. It has been stated that the Tarmonbarry weir is placed too high, and that it is raised above the adjoining country on either side?—The Tarmonbarry weir is fixed at a lower level than was proposed in the Parliamentary plans of the Shannon Commissioners, and the summer water was raised 1 ft. 4 in. in order to obtain the navigation level, in accordance with the plans referred to.

654. Is it placed too high now?—It is not.

655. Can you show the effect upon the adjoining lands?—I can by these tables, but I would wish to mention that there is a mill at Cloondrah. Some shoals have been taken away between the confluence of the Camlin river with the Shannon and the weir below, and the effect has been that this weir being placed at a lower level has taken away the water from the mill at Cloondrah, so much so that the mill-wheel had to be lowered 3 ft. 6 in. in consequence, and the head and tail races deepened.

656. Mr. *Pollard-Urquhart.*] Do you recollect the name of the owner of that mill?—Fleming.

657. Mr. *Sclater-Booth.*] In consequence of that I suppose the lands adjoining were very much benefited?—Considerably.

658. During the time that you were upon the river, in addition to the observation which you made in accordance with your instructions, had you the opportunity of conferring with the owners and occupiers of adjoining lands, and hearing what they had to say as regards the flooding of the country?—I had with the occupiers.

659. What was the general impression made upon your mind by those statements?—In the first reach, that is Jamestown, there have been lands reclaimed and now under tillage, that were perfectly valueless before the works were executed, consequent on the summer water being lower now than formerly.

660. Above the Jamestown weir?—Yes.

661. And what in other parts?—There has been great benefit conferred on the Ruskey Reach; there are lands now tilled there that could not be tilled before the execution of the navigation works.

662. Speaking generally as to the whole course of the river, has the impression remained on your

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mind that the execution of the works, as far as it has gone, has been favourable to the condition of the adjoining lands?—They have; I can better explain this by reference to those tables.

663. *Chairman.*] Do you wish to convey to the Committee that there was satisfaction expressed at the execution of the works by the proprietors on the banks of the river?—I do. Not by the proprietors, but the occupiers and persons long resident in the lands. I can quote numerous instances; that is, as regards the present state of the lands contrasted with their condition anterior to the execution of the works.

664. Colonel *Vandeleur.*] Do you take the whole line of river?—Down as far as Portumna.

665. Do you mean to say that on the Meelick level, from Meelick to Athlone, there is satisfaction expressed?—There is.

666. Mr. *Pollard-Urquhart.*] You say you have heard satisfaction expressed by some; have you not heard dissatisfaction expressed by others?—I have not.

667. Mr. *Bonham-Carter.*] Have you any record of the amount of rainfall at the two periods of the floods of 1836 and 1853?—I have not.

668. Of neither of them?—I have of 1853.

669. Will you be so good as to give us such records as you have of the amount of rainfall?—It is stated in Mr. Bateman's report. There are no records kept at the Board of Works, but we have got it from collateral sources.

670. Will you give us such memoranda as you have of the amount of rainfall in the case of either of these floods?—The rainfall for the flood of 1852 and 1853 was, 1st December 1852, eight inches and a-half.

671. Mr. *Ormsby Gore.*] Where?—At Galway.

672. Mr. *Sclater-Booth.*] Galway would be the nearest?—I am taking them in their order. In January 1853 it was 7·9, or nearly eight inches. At Markree Castle it was, in 1852, 7·38 inches, and in January 1853 it was 6·13 inches.

673. Mr. *Bonham-Carter.*] Those are the rainfalls for the month?—For the month.

674. Mr. *Sclater-Booth.*] Have you any record of the rainfall of 1836?—No; but I have some others here.

675. Have you endeavoured to get any memoranda of the rainfall on that occasion?—I have, and failed.

676. However, you give them as the two great typical floods of the period before the works and the period since?—I do.

677. Mr. *Pollard-Urquhart.*] You said, just now, that you had spoken to all the proprietors of land adjoining the Shannon, and you found there was general contentment with respect to the drainage works. Have you spoken to the proprietors of land between Counsellors' Ford and Meelick?—Not the proprietors.

678. The occupiers?—The occupiers or persons I met on the lands, who, from having resided always on the lands or contiguous thereto, were competent to give an opinion.

679. And did you find there was general contentment among the occupiers of land between Meelick and Counsellors' Ford?—I have spoken to some parties there; they told me that the land was not much improved, but they were not in a worse position than they were before.

680. Was that the universal impression, that they were not in a worse position than they were before?—If you will permit me, I will give you the evidence of three parties. There is a party here named Patrick O'Shaughnessy. He was born on the lands, and has been living there ever since. He says he has no doubt the callows are more valuable since the navigation works were completed.

681. In what year did he state this?—In 1865.

682. Mr. *Gregory.*] Where does he live?—Between Meelick and Banagher.

683. On what townland?—Cloonaheenogue.

684. What does he say?—Do you wish me to read the whole of his evidence?

685. You may as well tell us what he says?—He states that the callows are improved since the sinking of the Shannon, as the summer and autumn floods do not rise so high, but in the winter season the floods rise as high as ever they did. Before the Shannon works, the floods did not rise so rapidly as now; at that time, when the wet set in, the people had time to prepare; the floods rise more rapidly now, but they pass off as quickly. There is no doubt but the callows are more valuable since the navigation works were completed.

686. Mr. *Pollard-Urquhart.*] You have some more evidence to the same effect, have you not?—Thomas Killeen, age 67, born on the lands, is of opinion that the callows are no worse, but rather better since the building of the new lock.

687. Where does he live?—On the townland or island of Inshirckeigh.

688. Have you some more evidence?—Yes, I can give another instance; Mr. Dolan, tenant to the Board for Cloonaheenogue, states that he has had a long experience as to the effects of the floods on the lands, especially between Banagher and Meelick, before any improvements were carried out in the Shannon. He has heard a great deal as to the callows being worse off since the Shannon works were completed; but from his own knowledge such is not the case; he considers the callows are much improved. There is no doubt the water rises very rapidly; but then it passes off as quickly; the floods in winter rise as high, but we do not mind them, as they do no harm.

689. Those are the principal witnesses in favour of your assertion, that there was general contentment as to the effects of the drainage?—Not at all. These are exclusively confined to the reach between Banagher and Meelick; I have got many more, as to the other portions of the Shannon.

690. Mr. Lynam says, that on the 22nd of June 1860, he inspected the place professionally. He saw the water over the grass over 4 ft. 6 in. deep, and he found the dam was the sole obstruction to the flow of the river. Have you inspected that part?—That is an exceptional part; if you will permit me, I will explain to you. There (*pointing it out on the plan*) is Counsellors' Ford. There were rapids a little below the part that Mr. Lynam refers to, down to and below where the present weir is; in addition to which, a dam was put across the old channel, below this place, the portion that there is said to have been six inches of water upon; consequently the water was dammed up. I have no doubt that is the case, but it is an exceptional case, and very limited in extent. It is in consequence, however, of the weir and dam being put below, and damming up the river where the rapids previously existed, that this land has not been benefited as much as may have been expected.

691. But is it not a fact that a certain grass farm

farm there, is rendered comparatively useless in consequence of these Shannon works?—I have not heard of it.

692. Mr. Lynam, I think, states it; he says that the manner in which the works have been done, is the sole cause of inundating every year one of the best fattening farms in Ireland; did you hear nothing of that when you were in that neighbourhood?—I knew of that; but it was an exceptional case, as I have already explained; and I am sure Mr. Lynam knows I am not exaggerating in what I said with regard to it.

693. Then you mean to say that is the only complaint you have heard, or the only expression of dissatisfaction?—The place you are referring to now, is within, I suppose, a mile of Meelick; it is only five miles between Banagher and Meelick.

694. I do not know exactly the distance it is between Meelick and Counsellors' Ford?—It is not more than a mile, or a mile and a half from Meelick Weir, and quite close to the dam on the old channel.

695. Mr. *Gregory.*] Is not this very farm to which you are alluding the farm of O'Shaughnessy, the man whom you have quoted?—O'Shaughnessy is a common name down there. I know there is more than one O'Shaughnessy.

696. What I want to know is, is not this very farm which you do state is very much deteriorated, the farm belonging to that identical witness, whom you represent as stating that things are not worse than they were before?—I cannot say; this map will, perhaps, better explain it.

697. Mr. *Pollard-Urquhart.*] Did the owners and occupiers of these lands express universal content with the result of the works of the Shannon?—I do not say they expressed universal contentment. I spoke to the parties whom I have named, as to the result of the works executed for the improvement of the navigation, in regard to the flooding of the lands, whether they were improved or otherwise. I am only stating in general; I am not particularising.

698. You made a very general and a very sweeping assertion that all the owners and occupiers with whom you conversed expressed universal contentment, because I expressly asked you if it was universal, and you said it was, most certainly. I thought you might wish to qualify that answer afterwards, and then I asked you again?—I have only spoken to three persons on that part of the reach, a distance of five miles, viz., Banaghan to Meelick; and those three persons I took to be the most intelligent persons I met with; not as to contentment, but as to the improvement of the lands.

699. There are others interested in the drainage whom you did not meet with?—It was only those persons I met going along the land that I talked with.

700. Then your knowledge is very far from universal or extensive; you say you spoke only to three people?—Between those two points I spoke to only three persons.

701. Then, I ask you again, do you mean to say your knowledge of the effect of the works is universal or extensive?—No, certainly not universal; but I have data to prove that what I say is correct.

702. Have you the evidence given before the Committee of the House of Lords?—I have not.

703. Colonel *Vandeleur.*] Are you aware how long the floods remain on some of the lands in the neighbourhood of Counsellors Ford?—I have prepared a table which will show that.

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704. How many days, or months, are they covered?—Taking a period of 17 years since the works were executed?

705. Not taking the period, but the separate years, because one year may be a dry year, and the next a very flooded year?—The lands were flooded since the execution of the works, in the first year, 1856, for one day.

706. Upon what reach?—I am now taking the lands between Banagher and Meelick. In 1860, in the month of June, the lands were flooded 14 days, and in July six days.

707. What portions?—This is for the four months of the year.

708. But what portions of the land; it is stated that there were 24,000 acres of land, and that 16,000 acres, I think, were generally flooded in the division between Athlone and Meelick?—I would have to refer to separate tables to give you that.

709. I have been down that reach of the river, and I have observed that there are parts of the land that are much higher that others; therefore you must not take one little particular portion of it; you must take it as a general fact?—If you will permit me to commence at Athlone, I will tell you. When the water is at 12 ft. 2 in. on the present gauge, or 7 ft. 3 in. on the former gauge, the water is flowing on the callows; when the water is at 13 feet on the old gauge, or 8 ft. 4 in. on the former gauge, a considerable extent of the callows are flooded.

710. How long, taking certain years, even the years of the large floods, are the lands flooded, not during the summer time when the waters flow off rapidly, but during the winter when the floods remain upon the lands?—I will take the highest flood.

711. During the winter?—During the winter, I have taken the highest flood at the last-named height before the works, and I have taken a similar level after the works and compared them.

712. But for what time of the year?—For the whole year.

713. *Chairman.*] Then it is an average?—No, I am not giving averages. These are actual floods. In 1836, before the execution of the works, all the callows were flooded 110 days, at the greatest flood height; in 1849, that is, after the works, they were flooded 39 days; in 1837, before works, they were flooded 120 days during the year; in 1850, after works, they were flooded 11 days; in 1838, before works, they were flooded for 155 days; in 1851, after works, they were flooded 33 days; in 1839, a year before the works, the register is incomplete, and I will take another year; in 1840, before works, the callows were 96 days flooded; and in 1854, after works, they were flooded 11 days. But I can give you the number per year.

714. Colonel *Vandeleur.*] You are speaking of the callow from Athlone to Meelick?—No, between Athlone and Shannon Bridge, because there were different levels, before the works, in the present reach, Athlone to Meelick.

715. You are aware that all along the bank of the river, from Athlone for many miles down, there are stakes put up to guide the steamers?—That is in case of winter floods.

716. The floods extend in some places three miles, and in some five miles?—Yes, but in the general level of the summer water it is 3 ft. 8 in.

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lower now than it was before, in consequence of the removal of the lock at Shannon Bridge, and the sinking of the bed of the river 4 ft. 5 in. below the up-sill of the old lock.

717. Mr. *Pollard-Urquhart.*] Will you turn your eye to the answers given to Questions 491, 492, and 493, in the evidence before the Lords?—I have read them.

718. Have you seen the lands referred to there, which are stated to have been deteriorated in consequence of the works on the Shannon?—I have.

719. And do you agree with the opinion expressed in that evidence, that they are positively deteriorated?—I do not.

720. How many instances are there which are said to have been deteriorated. and which have not been deteriorated; will you be kind enough to count them?—The island I referred to, I do not speak about that, because I know it is deteriorated. or at least not improved as much as may have been expected

721. But you see a great many more instances mentioned besides that island; how many instances does Mr. Lynam mention there of lands that have been positively deteriorated?—That is taking the valuation, but I do not think that is a proper test.

722. I am not asking your opinion of the test, but have you seen those lands that are said there to be deteriorated?—I have walked generally over them.

723. But you did not speak to the occupiers of them?—No; I merely conversed with those I met accidentally on the lands, and I asked them their general experience as to the effect of the navigation works on the lands, and noted it, and in some cases read it over to them again.

724. In reading the evidence of Mr. Lynam, did you not think that he conversed with a great many more people than you did?—This is not Mr. Lynam's valuation.

725. But you see what he has done there; do you not think that he inspected the lands, and conversed with many more competent judges than you did?—Mr. Lynam has merely taken this valuation from the general, or Griffiths' valuation.

726. Then you think that general valuation is bad?—I do not think they put the improved value on the lands; you know there is a clause in the Valuation Act, that all improved lands are not to be re-valued for improvements till seven years after the expiration of the works, and this valuation I believe to have been prior to that period.

727. Prior to the expiration of the seven years?—Yes, so that the improvements were not taken into consideration.

728. That does not appear to be Mr. Lynam's opinion, because he brings that forward as evidence that the lands have been deteriorated?—I have data here to show that they must have been improved, for they are not flooded as much as formerly.

729. In some instances has not the water risen much higher than it did before the works were made?—I can give you particulars as to that reach, if you wish.

730. I am not asking as to that reach alone, but I ask you, has not the water in many instances risen higher than before these works were made?—It has on some reaches, but that is no test.

731. Therefore on some reaches the land may have been deteriorated by the floods in consequence of the works?—Oh, but these are exceptional floods, and of very short duration.

732. Will you turn to the averages of the year 1861?—I have no averages; I have the actual heights.

733. I thought you gave just now the average of the floods?—I can give you the average of the number of days that the floods existed.

734. I wish to ascertain the greatest height to which the flood rose, during the great floods of 1861. I am not sure which table that is in?—I have given the pages in the contents for the different reaches. If you will mention any particular reach, or any particular lock, I will be able to give it to you.

735. Look at Banagher lock, if you please, at pages 24 and 25. I see the floods are there reported to have risen 10 feet 6 inches, and 10 feet 5 inches, in August and September 1861. Can you find any instance of their having risen so high before?—Yes; four inches higher.

736. In the same months?—No.

737. Then I am justified in saying that in some instances the floods have risen higher than before?—In an extraordinary and exceptional flood.

738. That of 1861?—Yes.

739. Have you any means of comparing that with 1841?—I have.

740. I mean of comparing the rainfall of 1861, and of 1841?—I will take 1841 as the wettest year on record, before the works were commenced, and 1861, as the wettest year on record after they were commenced, and I think the comparison between the two is the fairest that can be made, though I have not seen any correct record of the rainfall. Is it not a notorious fact that the water rose considerably higher in 1861 than in 1841, taking the summer floods?—There is only one place were the comparison can be drawn from for 1841, that is, from the rain gauge at Armagh. For September 1841, it is 2·31 inches; for the August flood of 1861, it is 6·29, or six and three-tenths, we may say; so that one is two and three-tenths, and the other six and three-tenths.

741. Are you sure those figures are correct; because 1841 was notoriously one of the wettest summers there have been in Ireland?—I take this from Mr. Bateman's report. I have no rain gauges to quote from.

742. Mr. *Ormsby Gore.*] Do you know the Rooskey weir?—I do.

743. Have you any plan of it?—I have not.

744. Are you not aware that there are two levels on that weir?—There are.

745. And that one is only in operation in case of floods?—Yes.

746. Do you speak of your own knowledge when you say that lands on the railway reach have been tilled since the works were completed, which were not tilled before?—I do not; it is from the information I received from parties that have such land under tillage.

747. Can you give the average number of days of the floods before and after the works were completed on the reach above Jamestown?—I can.

748. Will you give it to the Committee?—When the water is eight feet on the present gauge, or five feet six inches on the former gauge, a large extent of land is flooded.

749. I want the average number of days annually of flooding before and after the works?—Before the works there were 217 days of flooding annually; afterwards, it is 32·8, say 33 days.

749*. Will

749*. Will you tell me the same with regard to Rooskey Reach?—When the water is at seven feet seven inches on the present gauge, or six feet five inches on the old lock upper sill, a large extent of land is flooded. 170 days a-year was the average before the works.

750. And what is it now?—Forty-three and a half.

751. Will you give me the same with regard to the Tarmonbarry Reach?—There are two flood-heights given; in one only a portion of the callows were flooded, but in the other, the August flood of 1861, all the callows were flooded.

752. I want to see the figures?—When the water is at eight feet two inches on gauge, a large extent of land is flooded; at eight feet ten inches it is all flooded.

753. I want the average?—A large extent of land was flooded 155 days before the works, and 27 days after the works.

754. Then in fact the land was flooded at Jamestown 33 days, at Rooskey 43 days, at Tarmonbarry 27 days, since the execution of the works?—Yes.

755. Is it not a fact that Rooskey has received less benefit than the other two reaches?—The summer water has not been so much lowered on the Rooskey Reach as on the Jamestown and Tarmonbarry Reaches; it is only lowered a foot on the Rooskey Reach, while it has been lowered two feet one inch on the Jamestown.

756. Are these gauges kept on the same spot as they used to be kept?—No, not all; at Rooskey four gauges have been kept.

757. On the same sites that they used to be kept before the execution of the works?—Yes; two of the gauges are kept at the old lock sills, and two more on the new lock sills at Rooskey; and since 1865 a fifth has been erected, and registry kept, at the head of the old canal.

758. And those old lock sills existed before the works?—Yes.

759. Is there kept at Grave's Mill any gauge or register of the height of the water there?—No.

760. Then how do you give the evidence respecting it?—I take the summer water, and I level between the summer water and the axle of the wheel, and thus fix the relative levels with the upper sill of the old lock at Rooskey.

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761. Is that sufficient to give you the height?—Perfectly. It was low summer water when I took the levels.

762. The lowest summer level?—No; it was about three inches above the lowest summer level. There would be scarcely any incline between the surface of the water in the lake near the mill and where the gauges are, or at least the one that I used, at the head of the old canal.

763. You compare the lower summer level and the level at which the mill can work?—No.

764. Then for your evidence applicable to gauge you take the level at Rooskey?—I transfer the level at Rooskey; but when the levels were made for the Strokestown district the summer and winter floods were observed and fixed, and the winter flood then observed agrees with that marked in the Shannon Parliamentary plans, and which are shown on the section.

765. Mr. *Gregory.*] When were the flood gauges upon which you have based your calculations placed?—For which reach?

766. We will take the reach Mr. Ormsby Gore has just been speaking of; Rooskey?—The gauges are on the old lock sills. The old sills are there still. I do not know when they were placed there, but after the execution of the works, the present sills were placed at the new locks, and we know the difference between the two. I have levelled them. The difference between the upper sill of the old lock at Rooskey, and the new lock is 1 ft. 6 in.

767. When were the flood gauges placed between Athlone and Killaloe?—They were placed when the works were executed. The Killaloe gauge was not altered.

768. Is it not alleged that these flood gauges were wrongly placed for several years?—Yes, one of them, I think it was in 1852, after the Meelick works were executed; there were some changes or repairs made at Hamilton Lock, and in putting down the gauge instead of placing it on the top of the sill it was put at the bottom. Consequently there was an error of six inches recorded for a number of years, from 1852 to 12 July 1860, when it was reset, and the error rectified. I think you will see, on referring to the tables, that I allude to that.

769. They have all been corrected?—This one has been corrected.

Mr. JAMES LYNAM, was called in; and Examined.

770. Mr. *Gregory.*] You are a Civil Engineer? Yes.

771. Are you also a qualified land-valuer?—I am.

772. You have been also employed by the Government?—I served about 21 years under Government.

773. In what capacity?—In different departments of the Irish Survey.

774. What other works have you been engaged in?—I was for some years engaged in railway works, and for several years on drainage; thorough drainage and river drainage.

775. River engineering is a different sort of work from railway engineering?—Very different, as this case of the Shannon clearly shows; it has been so totally misunderstood up to the present time by many engineers who have gone over it.

776. Have you studied river engineering in particular?—Yes, I have in particular.

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777. Will you tell the Committee in what way?—I have read all the engineering books on the subject that are worth reading in the English and French languages, and I have studied the River Shannon and most of the rivers that have been drained by the Board of Works in Ireland. I was employed by the proprietors upon them subsequently, and I am now the engineer for four of the districts that were drained under the Board of Works, and for four other districts that are in progress under the new Act. I was elected a few days ago, as engineer, by a drainage Board out of 14 competitors; and I have made two trips to France, and up the River Seine from Rouen to some distance above Paris, in two different years, and inspected and sketched the weirs that are in the River Seine and the River Marne.

778. Have you made an engineering survey of the River Shannon?—I have made a complete

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and most accurate engineering survey of all the narrow parts of the River Shannon, where I thought it would be necessary to make excavations for taking off floods.

779. Have you made maps, and sections, and estimates?—The maps are in the room. They were forwarded by me to the Treasury on the 30th April 1867; that is a year and a week ago.

780. Have you also made a valuation of the lands flooded and injured by the Shannon?—Yes; I have made a minute and detailed valuation of the lands injured by the Shannon. I was appointed by the proprietors, and the appointment was sanctioned by the Government. Mr. Brassington made another valuation for the Government, and we compared our valuation, and adjusted them, and we ultimately agreed to the same figures and signed the same paper.

781. Did you extend your investigation at all to the tributaries of the Shannon?—We did, as far as the back-water of the Shannon goes, and no farther.

782. Will you give to the Committee, in the very shortest and fewest words possible, a sketch of the River Shannon?—The Shannon is generally said to flow out of Lough Allen.

783. Give merely the different sections from Lough Allen?—From Lough Allen to the mean height of the mean high tide of the Atlantic Ocean, the total fall is 149 feet in autumn floods, and the total length is 140 miles by the curves of the river. That fall is not equally distributed along the river; in 3½ miles, at Castle Connell, near Limerick, there is a fall of 60 feet. In 5¾ miles down from Lough Allen there is a fall of 22 feet. That appropriates 82 feet out of the 149 feet, leaving 67 feet for that part of the river which has not much fall, and upon which the lands are very much injured by floods.

784. Will you give the points?—The part of the Shannon that requires most attention is from Carrick-on-Shannon to the foot of the Killaloe Fall. That is the country near which the great mass of damage is done at present.

785. Is that what you apply the 67 feet to?—Yes; I am going to give it now in detail. It is composed of several lakes, making up a length of 49 miles, which are connected by a river channel in all 63 miles long; so that in the length of 63 miles of river, the fall given by nature to carry off the flood waters is 41 feet, or 8 inches per mile, which is a good fall for so large a river; but of that natural fall of 41 feet a portion only, viz., 16 feet, is effective under present circumstances, to propel the stream in flood. The remaining 24 feet is rendered useless by the works constructed on the Shannon under the Act 1 & 2 Vict. c. 61., and that is the great grievance of which all the proprietors with whom I am acquainted complain, viz., that, of the whole natural fall of 41 feet, 24 feet (nearly two-thirds) is rendered useless because of the solid stone weir mounds. There are six of these great solid stone weir mounds built across the river channel, in none of which is there any sluice or flood gate, or any moveable part. They were built by the Shannon Commissioners for the purpose of preventing the escape of too much water in dry summer weather, and maintaining the surface of the river high enough on the shoals and lock sills for navigation by large steamboats drawing 6 feet of water. That purpose they fulfilled pretty well, and still leave the surface of the river from one foot to 3 feet or 5 feet below the surface of the land, so that the summer water at the level which was prescribed by the Act of Parliament is not injurious to the land. It leaves some of the land 2 feet, some 3 feet, some 5 feet above it. In such cases of dry summer weather the weirs do much good and no harm, but when rain falls in quantity (as it often does in the west of Ireland) the action of these artificial mounds is reversed, and then they do much harm and no good. They are then wholly unnecessary for the navigation, because the quantity of water in the river is so great that even if the weir-mounds were totally removed from the river channel there would be more depth of water on the shoals and on the lock-sills than is necessary for any of the present steamers. Then the crops on 15,000 to 18,000 acres of land are destroyed by an inundation of from one foot to three feet of water only on the surface of the land, while 24 feet of the natural fall of the river is wasted in cataracts over these artificial obstructions. I have observed this myself frequently. The scene is actually absurd. It would be laughable were it not lamentable. All the inhabitants, rich and poor, see and understand this, and they are irritated by it to a great degree.

786. Mr. *Ormsby Gore.*] Then you do not agree with the evidence of the last witness, that the occupiers on the banks of the Shannon generally acquiesce in the efficiency of the works that have been executed?—I have made, I think, four or five tours over the Shannon, and in the course of my engineering duties and valuation I met an immense number of people. I am also personally acquainted with an immense number of proprietors and occupiers. I have often sat in the houses of occupiers during parts of wet days, and I have never heard a man express himself satisfied with them. I have heard hundreds, and hundreds, and hundreds express themselves in a way that I would not mention here. But I think I may say what I have heard magistrates, and deputy-lieutenants, and travellers—English travellers and American travellers—remark, that the state of the Shannon at present is a disgrace.

787. Are you acquainted with that particular piece of land of which Patrick O'Shaughnessy is the herd, who is described as a very intelligent witness, and who stated that the lands are not in a worse condition, but that they have been considerably improved since the Shannon works have been executed?—There may be several men called Patrick O'Shaughnessy, and I think there are, but I know Patrick O'Shaughnessy the herd, who is a remarkably fine-looking man, and who herds the best fattening farm of Inishirckeigh; a farm of which I was myself the agent for several years; I know the farm as well as possible, and if Patrick O'Shaughnessy said such a thing (and if he did not say it, I am sure Mr. Penny would not have put it down) he must have been very much mistaken; I do not say that the Shannon works have put the land in a great deal worse condition; I am not discussing whether they are a little better or a little worse; but the fact is that the crops on 24,000 acres are every day during the autumn months liable to destruction. I know the lands of Inishirckeigh very well; I know that part of Inishirckeigh which is an island, and is so good now that it is let to a solvent tenant at 2*l.* 10*s.* per Irish acre; it is injured to some extent, but not to a great extent; all the land

above

above it are, as far as Banagher, somewhat injured; but it is not a matter we would make great complaint about, or expect much compensation for.

788. The question is whether they are benefited?—They are not benefited, and it appears from Mr. Penny's tables that the waters have risen there a few inches higher than before; they did not do much extra harm, but it is a literal fact that the waters have risen there a few inches higher than before.

789. Mr. *Agar-Ellis*.] Then if there is any difference between now and before the drainage, it is to the bad?—I can satisfy you if time will permit, that the portion of land between Meelick and Banagher is somewhat more frequently flooded. I think what Mr. Penny puts in his tables is quite correct; that the flood is on for a less number of days upon an average, because we all know the floods rise on the land somewhat quicker now than formerly, and go off quicker; the outlets are clearer than before, when they were stopped up by eel weirs and other things; therefore, even if we had more floods, we might have them for a lesser number of days in the whole year, and I think that is so.

790. Mr. *Gregory*.] I think you said there are 49 miles of lake?—There are 49 miles of lake between Carrick-on-Shannon level and Killaloe.

791. Does that 49 miles require no fall?—In the lakes the water will lie horizontally, except in a very few cases, where the wind may be in a wrong direction, and then it will back the water up a few inches at the head of the lakes.

792. I think, a few minutes ago, you made use of the word "mounds"?—I did.

793. Are those mounds which you have described called regulating weirs?—They are called regulating weirs; and I used the word "mound" advisedly, because they are not made in the shape or form that a piece of even solid stone-work ought to be built for a regulating weir; they are mere mounds, and are not of the proper shape that science would dictate; and that they are not regulating weirs is evident from the facts that are shown in these tables; and in all the returns of the Board of Works, namely, that in one place, Athlone, the difference between summer water and winter water is frequently nine feet; so that it cannot be a regulating weir that allows the water to rise, nearly every year, to seven, eight, or nine feet.

794. Were they not built, ostensibly, to keep the water up sufficiently in dry summers?—Yes.

795. Were they not also intended to let off the water, and was it not specified in one of the reports that they were so intended?—It was.

796. Do you recollect in what report it was specified?—In the Second Report it is so stated; and in Mr. Rhodes' Report, and in the Eleventh Report it is stated that they were intended to let off the superfluous water; and it was fully expected they would keep the water down to a certain level, so that it would not go out on the lands. If time permit, that is capable of the clearest proof.

797. Will you turn to the Eleventh Report, and read the seventh and eighth paragraphs?—"To ensure a sufficiently quick discharge for the water during wet seasons, and preserve a sufficient depth for navigation during the dry weather, it became necessary to construct three great regulating weirs; one at Killaloe, 1,160 feet in length, at the lower extremity of Lough Derg, where the rapids commence; one near to Victoria Lock, above the falls of Meelick, 1,100 feet in length; and one at Athlone, adjoining the great lock at that place, 720 feet in length. These several weirs have proved very efficient, and discharge the water so rapidly as to prevent any accumulation taking place above them at any time."

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798. Is that a correct description?—It is absolutely untrue.

799. These are the mounds to which you have referred?—Yes; it is a curious fact that a flood had come on in the previous October, and had remained on the entire of the lands until about the date of this report, the 30th of March 1850; it had covered the entire of the lands during that period, notwithstanding which that statement was signed on the 31st of March.

800. Do you think it is practicable to construct upon the Shannon regulating weirs that will really retain the water in a dry summer and let off the ordinary floods; I am not speaking of such extraordinary floods?—I am quite sure of it.

801. Have you designed any such weirs for the Shannon?—I have. This is a design on paper, and this is a model (*producing same*).

802. Will you describe to the Committee, very briefly, what you propose?—I propose to make a foundation sufficiently strong, which is quite practicable; to make the supports of cast-iron, and to hang a number of those flood-valves at a sufficient height to preserve a legal and sufficient depth for the steamers. At Killaloe there is proposed to be a line of these valves across where the red line on the plan is drawn; I think 84 of them. They are five feet broad, and they are to fill 440 feet across. This (*pointing to the plan*) is the present weir-mound at Killaloe, which does all the harm. I propose to take that mound entirely away. The foundation can be sufficiently strong by mason work to hold these valves. There is always a lock-keeper and assistants engaged here, with unfortunately very little to do in the way of opening the locks for commerce, and he can easily attend to these valves. As soon as the water rises above the legal height for navigation, he can open a valve and the water teems out, and there will be about four feet and a half of water over the valves. They are intended to be 7 ft. high by 5 ft. broad.

803. Mr. *Ormsby Gore*.] In case of neglect, would it not be self-acting?—It would; but I should not provide for that; there is a man there always under pay, and he should be made to open and shut them. He opens two or three or five of these valves, and if at the end of half a day he finds the water is lower, he closes them; if he finds the water still rising he opens two or three more. In dry weather they will be all closed; in high floods they will be all open; the water will teem down over them to the depth of about 1½ feet, and there will of course be an additional depth under. Trees, bushes, ice, and all that class of things, will pass freely out. This is not an invention, it is a mere modification of about 40 similar weirs, some of which I have seen in operation in France. Last week I had the pleasure of pulling one of them up from the bed of the River Seine, shutting it and opening it again. In a flood of a large magnitude the whole natural fall of the surface of the river, which is 41 feet from Carrick-on-Shannon to Killaloe, will be available and effective for propelling the stream. The obstruction caused by the machinery will be only about two inches of waste, whereas by another

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another kind of sluice proposed by others there will be a waste of two feet. At present the state of the case is this: there is a line on the plan (*pointing to it*) showing the height of the great flood of 1861, which destroyed 20,000 *l.* worth of property, and there is also shown the pier-head, where the steamers land, and where there is great deep water: further down it becomes shallow. At the time of the flood of 1861, when there was but 1½ foot of water on the lands in the reach above Portumna, there was a clear fall of two feet of water in the place to which I am referring that could not be made available; there is there a cataract of two feet which cannot be made available, and which goes to waste. Now I am prepared to prove before scientific men that if this mound were removed, and if there were a line of these valves, as the French have them on the Marne and on the Seine, there would not have been 100 acres of land flooded in 1861 upon that reach of the river up to Meelick.

804. Mr. *Gregory.*] Have you personally inpected these sluice-gates on the Marne and on the Seine?—Twice. I went two years ago, during an adjournment of the Lords' Committee, at my own expense, to France to see those sluice-gates, and latterly I went, a short time before the sitting of this Committee. One of them is at Poses, a little above Elbœuf; another is at Port de l'Anglais, a little above Paris. There are two in the river within a mile of each other. The one from which this is modified is at a place called Port de Langlais, about a mile above where the Marne enters the Seine, and two or three miles above the city of Paris; I went up to it, a part of the way, in a steamer from Pont Neuf, and in a boat for the remainder of the way. I want to impress this upon the Committee: after all the trouble and expense I was at in searching for these weirs on the Seine, I could not see them; they were all invisible, lying under water. The sluice-keepers began to clean and prepare them; they told me they had an order to raise them the following day at 12 o'clock; that the water was falling, and it would then be time to raise them; but all the winter these sluices were at the bed of the river, allowing the flood to pass off freely. I think when these are found to answer in the Seine and in the Marne (and they have been working there since 1855) they should do equally well in the Shannon.

805. Is there not considerable apprehension that a great current would be caused by flood-valves of this description, which might be dangerous to navigation, or be a great impediment to the navigation at Killaloe?—There can be no current in the navigation channel, then, at Killaloe, because it will be a still-water navigation all the way up to the deep water. When the canal company made the canal from Limerick to Lough Derg, they carried it up until they got into still deep water, leaving a small piece of ground, and building a mound and wall between their canal and the rapids. The canal was entirely protected from the current by means of this wall. The Shannon Commissioners took the wall away, and in that they were warranted by the Act of Parliament; but the consequence is, that there is a current there now in high floods so great that I have myself seen 11 horses and 25 men trying to pull up one boat. I saw it myself when I was there on other business many years ago. I have a letter from a gentleman residing at Killaloe, who tells me that, in every high flood, the steamer now doing the traffic on the river must be aided by men or horses. It is not a great expense to rebuild that wall; the cost of it will not exceed 1,000 *l.*, and that should not stand in the way. After being completed, of course the sluice can produce no evil; but if it were desired to stop the flow, the whole line of sluices could be closed by a couple of men in about 20 minutes. There would then be no run from Lough Derg for two hours, or for five if you chose; and that stoppage of the run from it would not raise the level of the lough to one-tenth of an inch. There is no navigation here on Sundays, or at night. Only one steamer goes up in a day and one down on an average, and there would be no trouble, neither difficulty nor evil, arising from the closing of these valves, or a part of them, when a vessel came in sight, but it would not be necessary. I am prepared to prove in detail, before referees, that these valves would actually do away with the current, providing always that this dam be rebuilt.

806. I think Captain Wynder gave evidence before the Committee of the House of Lords, that the impediments to navigation at Killaloe, that now exist, are considerably greater than they were before the Shannon works were finished?—Captain Wynder gave evidence, that I know myself to be true, and it is this: the state and circumstances of the River Shannon at Killaloe, since the execution of the works there by the Shannon Commissioners, are far worse for navigation than they were before.

807. And Captain Wynder has admirable opportunities for observation, being captain of one of the steamers that are continually plying there?—He says in his evidence that three men or a horse would draw up a boat there in old times. There is no doubt that the state of the river there was sufficiently good for navigation before.

808. Colonel *Vandeleur.*] Lowering that wall was considered a great mistake?—Yes.

809. There are piles along the whole range there, preventing boats from being swept across?—Boats are let down stern foremost, in high floods, and swung from one pile to another. I myself travelled on one of the Canal Company's boats there about four years ago; I had a conversation with the master of the vessel, and he told me, "You would pity me to see the state of anxiety I am in, going down there in floods, with this valuable cargo, and these poor men on board, knowing the danger I am in.

810. No doubt it is a frightfully dangerous place, but is it absolutely necessary to take away that old mound; could you not utilize it?—Every bit of a mound you leave is so much obstruction. You cannot make use of the fall it occupies when you want it, when the floods come.

811. You cannot put your valves in that?—I should be very sorry to put them in that oblique manner, because the water would have to make two turns, one going in and the other going out.

812. Mr. *Ormsby Gore.*] It would make it much more expensive?—Much more expensive. With regard to the excavations and the cuttings, I surveyed those myself. It was not done by assistants. I did it all myself. There are two feet left in the bottom there beyond what is specified by the Parliamentary plan.

813. Colonel *Vandeleur.*] You state there was a 100 feet not cut away. Will you point that out?

out?—The yellow shows the piece. I have made these plans with the utmost accuracy, and transferred the lines from the Parliamentary plan.

814. That not being cut away, it forces the water over on the other side?—It does.

815. And increases the current against the canal?—Yes.

816. Mr. *Bonham-Carter*.] You say that this shoulder forces the water, as of course it does, towards the opposite bank. Is not that also the effect of the present weir-mound?—It is certainly.

817. Supposing that mound had been in an opposite direction?—It would be much better.

818. Mr. *Gregory*.] Is it true that there is no sluice or flood-gate on any part of the Shannon works from the beginning to the end?—It is the fact that there is no sluice, flood-gate, or other flexible opening in any one of the works. In some of them there is what is called a "fish-gap," but it is a curious thing that even that is in one instance stopped up by timbers.

819. Mr. *Ormsby Gore*.] What instance is that?—Meelick.

820. Mr. *Gregory*.] Have you seen the great sluices in the weir in the Corrib river at Galway?—I have.

821. Have you seen also in the Corrib river at Galway a great falling-board, which stands up in summer and is raised up in winter?—I have.

822. Have you examined it?—I have.

823. Will you give an account of it?—I will. It is a curious fact this is, the system in action on Long Corrib at Galway. There are two sluice-gates, each measuring 10 feet, and the falling-board is 179 feet long, and one foot high. When the water begins to rise so as to endanger the land, one or two of these sluices are opened, and if it continues to rise, they also turn off this board, which is a great relief to the lands above, and lets off the water. This very thing was contrived and built by the Board of Works at Galway.

824. Colonel *Vandeleur*.] And it answers very well?—I do not know that it is quite enough; I think if there had been another board extending the whole way it would have been better, and would not have interfered with the navigation.

825. Mr. *Ormsby Gore*.] You know the sluices on the Ballinamore Canal?—Yes; I saw one of the sluices.

826. Do you approve of their operation?—No; they are very bad.

827. Mr *Gregory*.] Do you think any one in his senses would at present construct a weir or dam without a falling board?—No one would.

828. Did not the landowners in the neighbourhood of Portumna, and Lord Clanricarde in particular, apply to the Commissioners for leave to put up flood-valves at this very place, Killaloe?—They did.

829. Did they offer to do that at their own expense?—They did.

830. Will you describe to the Committee the circumstances of that application and its result? Several of the owners having flooded lands on the reach between Killaloe and Meelick, determined to take advantage of the recent Drainage Acts, particularly of Colonel Dickson's, which is called "The Outlet Act." They called me, and I designed a system of flood-valves for the weir at Killaloe. We considered that the Board of Works were legally the owners of the weir at Killaloe, and therefore we served them with notice according to the Act, asking their leave to put flood-gates there. This is a printed copy of the application, which, as it is very short, I might read it:

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"THE SHANNON INUNDATIONS, LOUGH DERG LEVEL; from *Killaloe* to *Meelick*, 31 Miles.

"Act 26 Vict. c. 26.

"1. *Application to the Commissioners of Public Works in Ireland for leave to improve the Watercourse of the River Shannon to Killaloe.*

"To *Edward Hornsby*, Esq., Secretary to the Commissioners of Public Works.

"2. WE, the undersigned owners of lands flooded and injured by the overflowing of the River Shannon between Killaloe and Meelick, are desirous to drain those lands and to prevent the inundations; and in order thereto, we deem it necessary that the present watercourse of the Shannon in the outlet from Lough Derg at Killaloe should be improved by altering the great weir mound, which extends across the river there, as follows, viz.:—

"3. First, by removing a portion from the top of the said weir mound equal to one foot in perpendicular depth from the apex thereof for its entire length, as shown by the red shade from A to B, to C and D on the accompanying map and section.

"4. Secondly, by removing 600 feet in length of the northern portion of said weir mound, as shown by the red shade from D to E on the accompanying map and section, and replacing same by moveable sluices, to be opened more or less, as may be necessary, in wet weather, to let off the flood waters, and to be reclosed in due time securely, so as to maintain, even in the driest seasons, the height of six feet of water on Killaloe Lock sill. The sluices are to be placed in the line C E.

"5. We hereby apply to the Commissioners of Public Works in Ireland for leave to make those improvements in the watercourse at Killaloe.

"(signed) *Clanricarde.*
Dunsandle.
Avonmore.
Thos. B. Stoney.
Henry Trench.
John H. Blake.
J. P. Fetherstone H.

"MEMORANDUM.

"To *Edward Hornsby*, Esq., Secretary to the Commissioners of Public Works.

"6. THE improvements we ask for leave to make cannot in any way injuriously affect the navigation of the Shannon, as established at the recommendation of the Shannon Commissioners by the Legislature in the Act 1 & 2 Vict. c. 61. The legal depth of six feet of water will still be maintained on the sill of Killaloe Lock in driest summer weather. That is the depth of water which the Shannon Commissioners fixed on in 1837, as delineated on their plans deposited with the Lords of the Treasury, and referred to in the Act above quoted. It is admitted by all parties that that depth

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depth is sufficient for steam navigation. But the water in Lough Derg never falls below seven feet on the sill; it is generally 8½ feet over it; that is 2½ feet more than is warranted by the recommendation of the Shannon Commissioners, or sanctioned by Parliament, 2½ feet more than is necessary for navigation. It is but a few inches under the surface of the meadows. The land is then so wet as to be, during many months each year, unfit for any agricultural purpose; no cattle can be let on it, and none of the fine species of grass can flourish on it, the only herbage on the greater part of it being various species of sedge and bent On several portions of the richest alluvial soil the very valuable horse-hay, *phleum nodosum*, grows naturally, but is nearly choked by the weeds; meadow-sweet, *spiræa ulmaria*, and yellow loosestrife, *lysimachiavulgaris*, rendered luxuriant by the moisture, so as to grow three feet high and occupy two-thirds of the surface. Even in summer the water is penned up 1½ to 2 feet higher than is necessary for navigation, and within 15 or 18 inches of the level of the land; and many times, in summer and autumn, Lough Derg and the rivers are kept brim full for many days. Then the crops on 3,000 acres lie for weeks at the mercy of the elements, and 12 hours' heavy rain would cause a destructive inundation. This occurred in August 1861, when the whole of the crop was destroyed; and it may occur any year, and will certainly occur periodically under the present circumstances. Those inundations are notoriously very injurious to the navigation also. All the masters of steamers complain of the delays and dangers thus caused.

"7. This is a state of matters that the Commissioners of Public Works must naturally be willing and anxious, not merely to give the proprietors leave to remedy, but even to facilitate them to the utmost of their power in remedying, both for the improvement in the navigation and the preservation of the crops of 3,000 acres of meadow land.

"8. Mr. Bateman, the Commissioner who carried out the inquiry last year into the causes of the inundations and the means of preventing them, reports, page 7, 'That works may be carried out which will everywhere prevent injurious flooding, and maintain the navigation in all its parts in its integrity;' and, in page 12, 'From Meelick to Portumna the land would be saved from flooding, if the water could be kept down two feet lower than it rose in August 1861.' He adds: 'I propose to accomplish this by putting sufficient sluices in or adjoining to the weir at Killaloe, and by improving the approach from the lough to the weir.'

"9. Mr. Bateman' designs and estimates were made on the supposition that the river Suck and the five upper divisions of the Shannon would be drained. It is now only proposed to drain the level from Killaloe to Meelick, for which very little more is necessary than to improve the outlet; and we propose to improve the outlet only to the extent necessary for this level of the river. But the works of improvement we propose are so designed, that when the river Suck and the five other divisions of the Shannon will be drained, these works will require no alteration, but will act efficiently as part of the larger design that may then be necessary.

"10. The improvement we ask leave to make will operate as follows, viz.:—

"In all ordinary wet weather the sluices will be kept open as far as may be necessary to keep the water in Lough Derg down to the Parliamentary level, viz., six feet on the sill of Killaloe lock. Whenever a flood may occur, the lough, which contains 30,000 acres, instead of being brim-full, as under the present system, will be three feet under the surface of the lowest meadow land, and there will be a reservoir to receive and retain the influx of sudden floods of the immense capacity of 3,920 millions of cubic feet, a reservoir sufficient to contain one-half of the great autumn flood of 1861 for five days, assuming that the other half would be carried off at Killaloe. The accumulation of the first flood will be gradually let off, so as to have the reservoirs ready to receive and retain the inundating portion of the succeeding flood, and so on.

"11. The beneficial effects of this arrangement will be very great, not only to the Portumna level, but also to the Bird Hill and the Newcastle levels below Killaloe.

"12. We propose that the opening and closing of these sluices shall be under the joint management of the Killaloe lock-keeper (as the servant of the Board of Works), and a sluice-keeper, to be appointed and paid by the proprietors of flooded lands, and according to a system to be agreed on.

"13. We propose to execute the works ourselves, at the expense of the lands to be improved; that the design of the sluices shall be subject to the approval of a Government engineer, who shall also superintend officially the execution of the works; to see them done according to the approved design.

"14. We hope that the Commissioners of Public Works will, under the provisions of the 26 Vict. c. 26, assent to this application; but if they will not assent, we must ask them to name an arbitrator in accordance with the Act, and we hope they will do so with the least possible delay, in order that the matter may be legally settled in time to have the works executed before the usual period of floods, viz., the month of August next year.

"15. Plan No. 39, of the Second Report of the Shannon Commissioners, is attached to this memorandum. On that plan the engraved black lines show the heights of floods before the execution of the works. The strong red line shows the height recommended by the Shannon Commissioners in 1837, and sanctioned by the Act 2 & 3 Vict. c. 61, as the permanent level of the water.

"The lower edge of the blue shade shows the present low summer water, and the upper edge of the blue shade shows the height of floods since the execution of the works.

(signed) "*Clanricarde.*
"*Dunsandle.*
"*Avonmore.*
"*Thos. B. Stoney.*
"*Henry Trench.*
"*John H. Blake.*
"*J. P. Fetherston H.*"

"12 January 1864."

831. That

831. That was refused?—That was refused.

832. Upon what grounds?—The Commissioners wrote in reply that they had taken the opinion of their engineer, and that he had reported that if these works were carried out, it would render the navigation very nearly useless. Lord Clanricarde then asked for a copy of the engineer's report, with which he was supplied by the Commissioners of Public Works. I have a copy of that report in my hand, and I find that there are 11 mistakes or errors in the allegation made in the report.

833. Are those important errors?—They are principally as to facts.

834. Of course you would naturally be very careful in putting your individual opinion against the officially expressed opinion of the engineer of the Board?—I certainly would be very careful; but the circumstances of this case are such, that I think it would be highly culpable in me if I did not tell the whole truth out plainly.

835. Through all those 11 errors, can you give the Committee a description of one or two of what you consider the main errors of the engineer of the Board of Works?—In the first place, he says, "The present level of the head weir, with the exception of the portion near the lock, is seven feet six inches higher than the upper sill of the lock."

836. Is that untrue?—It is not the fact.

837. What is the fact?—Six feet ten inches.

838. You take that from your own measurements?—Yes. As we are upon the matter of Killaloe weir, I had better say that I measured the height of that weir myself.

839. Are there any other points that you particularly wish to specify?—He says, "It would leave a depth of only three feet for sluices." That is a mistake.

840. What depth would it leave?—It would leave about five feet.

841. And he says, "It will be found that the loughs must rise to nearly the same height as at present"?—That they could not do if there were a couple of hundred feet of sluices. That is patent. He says, "It is now sufficiently apparent that if the proposed scheme should be carried into execution, the river channel, from the deep water above the wharf to the bridge, would be converted into a most dangerous torrent." That is what it is at present; a dangerous torrent in time of floods. He cannot "convert" a thing into what it is.

842. Is there any other error in that report that you wish to state to the Committee?—Yes. He says, "It is also a grave error to assume the readings of the water-gauge at Portumna Bridge in preference to those of the gauge at the pier-head at Killaloe, giving the true level of the entire surface of Lough Derg, for it omits the very important element of the influence of the wind." The wind acts there. The gauge at Portumna tells where the water is, and where the land is, for there is little or no land damaged by the Shannon at Killaloe. It is not till you go up about 20 miles that you find the land damaged. It is the Portumna gauge that tells that.

843. Can you tell the Committee briefly the difference between the mode in which Mr. Bateman proposes to deal with Killaloe, and the mode in which you propose to deal with it?—Yes, that particular case of Killaloe is the important one. It is rather a venture of me to go directly against Mr. Bateman; but he proposes to cut that piece away (*pointing on the plan*). It is so high that a part of it is 17 or 18 feet above the surface of the water, and he will have to cut away here, about 18 feet deep, before he comes to the water's surface, or before he lets away one bucket of water.

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844. Mr. *Ormsby Gore*.] The highest point is 18 feet?—I think the highest is 25 feet, but I will not say; I think he has to cut 25 feet deep, but his sections are here; his map will show it better; he then proposes to run his sluices across in that manner (*pointing on the map*) so that the water in coming here has to turn one way to get into them, and another way to get out of them.

845. Obliquely?—In both cases. He then proposes to let a piece of that mound remain, which I object to; I insist, and I will prove it before referees, that a direct line across at right angles to the line of the current is the proper line to make. Then again we know that this side of the river bed is not all rock, or nearly so; I know in moderate summer weather one-half has only from six to twelve inches of water in it; there is no difficulty in throwing the whole of the water during summer into the other side, which is deeper. Then we have a great waterfall here (*pointing to the lower end of the plan*); at low water you begin to excavate there; you are quite protected; you require no pumping because the tail water will run off by itself; there is a great fall. Now every cubic yard you take out of the bed will let off so much water when those sluices are built; whereas you will have to take off, I think, about 20 feet deep in Mr. Bateman's scheme before you can get anything effected with regard to the sluices; this is a pattern of the sluice I propose (*producing a model*). This (*producing a copy of Mr. Bateman's plan*) is an exceedingly pretty drawing. The weir is entirely of iron, and the sluice-doors are to be of iron. What I object to in the plan of this sluice is, that the immoveable part of it occupies a third of the sectional area of the water, so that when it is to be open as far as its machinery will admit, there will still be a third part of the sectional area of the water shut by these fixed parts. The surface of the water at the upper side of the sluices is to be two feet over the other side of the aperture, when the aperture is open to its full extent.

846. Colonel *Vandeleur*.] This is all iron framework?—Iron framework. The doors are pulled up by two bars and two wheels. There is a mill which works all these wheels in a very pretty manner, and it lifts the doors up, but it never lifts them up to the surface of the water. The surface of the water immediately above them will be two feet over the top of the aperture. The consequence will be that floating matter coming down will all be caught. In the section of this set of sluices the Committee will see there are eight openings, with an intervening plate between each pair of one foot in breadth. That is eight feet, calculating the area as I did yesterday, when an autumn flood will be passing, and these sluices will be open to the utmost limit; there will be four-tenths of the sectional area of the water shut; consequently it requires a fall of two feet from the water above, to the water below, to propel the flood through these openings.

847. Mr. *Ormsby Gore*.] Is the sluice self-acting?—I think it is self-acting, but that is of no importance.

848. Mr. *Gregory*.] However, that is the main difference

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difference between your system of flood-gates and Mr Bateman's?—Yes.

849. I think, at the present moment, there are six immoveable stone weirs in the River Shannon, from Killaloe upwards?—Yes.

850. Have you made any estimate of what would be the cost of removing those six stone weirs, and replacing them by your valve-weirs?—£. 20,000.

851. The whole six?—Yes.

852. What would be the beneficial effect upon the lowlands resulting from that expense?—It would improve every acre of land on the Shannon.

853. Could not this proposal of yours be carried out in sections?—It could.

854. Could not the experiment be tried at Killaloe?—It could.

855. From Killaloe to Meelick?—Yes, there is already before Her Majesty's Government a paper from Lord Clanricarde, asking that there may be an experiment made by constructing in this weir mound three or four sluices of different patterns, one of Mr. Bateman's, one of mine, and one of Mr. Forsyth's, who has a very good pattern, also different from both of ours, and would let them be worked for a few months; and let it be observed which of the sluices is the best, and which of them does most good, and which most harm. The cost would be about 300 *l.*

856. The cost of erecting these three valves?—Yes.

857. What would be the cost of making these alterations at Killaloe, and improving the drainage upon the section of the Shannon between Killaloe and Meelick?—£. 6,000 would remove that weir, put in the flood-valves, and re-construct the walls.

858. Do you think, if the experiment was tried upon that section, you would be able to arrive at a satisfactory result?—I do; but I am not quite sure about the 6,000 *l.*; I should consult my books for that.

859. It could be tried there. Lord Clanricarde proposed to try it here. I heard Lord Clanricarde say that he would pay 3,000 *l.* towards an improvement of that weir at Killaloe, and that he would go to the whole expense of putting a regulating weir at Killaloe if he were guaranteed that in the event of its being successful in benefiting the lands, the remaining proprietors should be made to pay their part.

860. Mr. *Gregory.*] Am I to understand that the experiment of the drainage of this section between Killaloe and Meelick might be tried for a sum not exceeding 6,000 *l.*?—The weir would cost 6,000 *l.*, but the restoring of the bank, and perhaps one or two other matters, would cost 2,000 *l.* more. I think 8,000 *l.* would do it.

861. Mr. *Ormsby Gore.*] As an experiment?—No, it would be a complete work.

862. If that was tried, would you not be able to judge from it as to whether the principle might not be applied to the rest of the Shannon?—Of course you could judge, and you could do it easier here, because the circumstances are really very favourable for an experiment. If you put in that extent of regulating weir, composed of flood-valves, about 200 feet, as an experiment, and take away a portion of the weir mound, and let the other remain, that could be done for a small sum, and it would be a grand experiment, on a large scale. I am prepared to prove that if these valves were put in according to the French plan, and kept regulated, no ordinary flood such as has been recorded during the last 20 years would flood 100 acres of ground on that level. It could be done without any excavation but that.

863. Are there 6,000 acres from Meelick to Killaloe?—5,883 acres, and it would clear the whole of them of floods.

864. Mr. *Sclater-Booth.*] That is the position you lay down; and if the mound were removed in the way you describe, no ordinary flood could take place in the level affected by that weir?—Yes, sir, if the mound were removed, and flood-valves on the French fashion were constructed, that would necessitate, of course, the rebuilding of the wall.

865. Mr. *Gregory.*] Did you know anything of the Shannon before these works of which we have been talking were constructed?—I did.

866. Have you often travelled on the steamboats on the Shannon before either of the Acts was passed?—Yes, before either of the Acts was passed.

867. That is from Shannon Harbour down to Killaloe and Limerick?—Down to Killaloe and Limerick.

868. There was very considerable steam navigation on the Shannon before these works were carried out?—There was more than there is at present.

869. Then you are not of opinion that the present navigation of the Shannon, whatever there is at the present moment, is due to these works?—I am not. The circumstances of the river for navigation by steam vessels of sufficient draught, such as are actually at work at present, are worse at Killaloe than before; they are a little better at Meelick and Banagher.

870. How is it at Portumna?—It is the same, precisely.

871. What amount of merchandise is at present carried on the Shannon?—I do not know; but I know that they have refused to carry me in their vessels as a passenger.

872. Do you know why?—They would not carry any passenger at the time.

873. Was that owing to the agreement that took place in 1860 between the Midland Railway Company and the Great South Western Railway Company that no passengers were to be carried on the river?—I do not know; but I know, as a fact, that I was at Killaloe wishing to come home by Portumna; there was a steamer, with steam up, preparing to start up the lake; I implored them, offering them any amount of money to take me, but they would not; and I had to hire a car and drive home round the lake.

874. Are you not aware now that I tell you that an agreement was entered into between these two great railways, that the passenger traffic on the Shannon should cease and determine after the year 1860?—I do not know anything of that; but I would like to make an observation, if you please, with regard to navigation: the Canal Company have a right to the navigation, and having a great interest in their company, I, for one, would not propose anything that would injure that company or their navigation; but I am perfectly sure my proposals would not in the slightest degree injure that navigation.

875. What depth of water do the steamers that are now plying there draw?—The steamers that are now plying were built a few years ago for the

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the purpose of effecting the traffic cheaper and more efficiently than formerly; they are called the Limerick, Athlone, and Dublin; they carry their own cargo; they are represented by a Mr. Latouche, the chairman of the company, as drawing 5 ft. 4 in. when laden and stopped; but a few years ago their engineer came to London and read a paper before the Institution of Civil Engineers, in which he says that their draught is 4 ft. 8 in.; but, in point of fact, during January, February, and March of the present year, of all the trips made up and down over Lough Derg by those steamers, there were but two cases in which they drew more than 4 ft. 6 in. when laden and stopped; that is a fact I have ascertained. If they had any greater draught than five feet through the lake, they should lighten their load at Killaloe, for they are prohibited by the Shannon Commissioners or the Board of Works from going with more than 4 ft. 10 in. draught on the Killaloe navigation.

876. I do not quite understand what you mean by prohibited?—They are prohibited by the bye-laws. No steamboat is allowed to pass through the Limerick navigation with more than 4 ft. 10 in. draught of water.

877. Then what is the least and what is the greatest depth of water upon the lake sills and shallows on the river?—I could tell you that, but here is Mr. Healy's statement of the River Shannon: "The steamers designed to carry their own cargo had to pass through locks which limited their length to 72 feet and beam to 13 ft. 3 in. They carried 50 tons with a draught of water of 4 feet 8 inches. Now the Committee has been informed that the water in Lough Derg is kept up only six inches above the Parliamentary height; the literal fact is that I measured it myself in the dryest season that ever came in summer, and I found it was actually 12 inches higher. In ordinary weather it is two feet, and on the 15th of last month it was 3 feet 2 inches higher than the Parliamentary plan, and at that time all the lands in that division were saturated; the greatest evil to the lands on the Shannon is not produced by the great floods which occur only once in 20 or 25 years. The greatest amount of damage in bulk, not on an average to the Shannon lands, is done by small floods, and by saturation where the waters lie an inch or two inches over the ground or within two inches of the ground. They lie there till perhaps the middle of May; consequently these lands so saturated are covered by a great growth of weeds, the names of which I could write out for you, and there is but little grass; whereas the lands not saturated produce the very best of horse-hay. Now what is wanted is not to attack the great floods, but that the small floods should be let off, instead of having the lands completely saturated through the middle of May, which they were last year and the year before. Last year I know several proprietors and occupiers sowed their crops, their potatoes and oats, particularly at Carrick-on-Shannon; in the month of April the flood rose, and though it did not go over the ground it rotted the seed.

878. I do not wish to interrupt you, but I want to keep you to the question as to the steamers; and you will see what I am aiming at by my asking you the question over again, which I did before. What is the least and what is the greatest depth of water on the lock sills and shoals on the River Shannon?—The least possible depth of water on the sills at Killaloe is 7 feet. The wall is 6 ft. 9 inches. There is never less than 3 inches depth of water passing over it; that makes 7 feet.

879. Why is that depth of water maintained when the steamers require 5 feet at most?—It is not necessary nor warranted, and it is in direct violation of the Act of Parliament.

880. Colonel M'Kerlie stated in his evidence that the navigation was more important than the drainage, but is there anything to prevent there being a lower depth of water, and at the same time keeping up a very efficient navigation?—Nothing whatever, in Lough Derg.

881. In the first place, is navigation of the same importance on the Shannon in the present day that it was at the time these works were constructed?—It is not.

882. Have you not railways intersecting the country at the present moment, and performing the part of carriers, which the river used to do in former days?—Yes.

883. I asked Colonel M'Kerlie whether he thought it was necessary to keep up the navigation to the depth of six feet, and he said, "I apprehend that for the sill of the navigation, the broad waters that have to be crossed by steamers, it would be undesirable that the depth of water should be diminished." Do you agree with that?—I will not give my opinion. I will give a fact, which is this; I know (I have ascertained it) that of all the trips made by the steamers across the lake during last January, February, and March, there were only two cases where the draught exceeded 4 ft. 8 in., stopped; and here is the Chairman of the Company's return to the Committee of the House of Lords, in which he says that their draught at full speed is six feet. This, I think, puts the matter beyond question. The Chairman of the Company returns his steamers as drawing, at most, 5 ft. 4 in. when passing the lock sills, and 6 ft. 2 in. at full speed; therefore allowing four inches of water under the keel passing the lock sills, we want, really, but 5 ft. 8 in. upon any lock sill. But we require a foot of water under the keel in passing over shoals, therefore we would require 6½ feet of water on shoals.

884 Mr. *Sclater Booth.*] Are these the same vessels you were speaking of that only drew 4 feet 8 inches?—The same; of course, in passing into or out of a lock, they do not draw sensibly more water than when at anchor, and allowing four inches of water under a vessel passing the sill (the Board of Works provides in their bye-laws that there should be at least three inches; from which we may infer that they consider three inches enough between the keel of the vessel and the sill of the lock); therefore we require for these vessels no more than 5 ft. 8 in. of water upon any lock sill.

885. Did I not understand you to say that these same steamers, in your opinion, only draw 4 ft. 8 in. of water?—I read from a paper which was read by Mr. S. Healey, who is manager of the same canal company. It was read before the Institution of Civil Engineers in London on the 13th of November 1866, and is as follows: "On the River Shannon the steamers designed to carry their own cargo had to pass through locks which limited their length to 72 feet, and beam to 13 ft. 3 in. They carried 50 tons, with a draught of water of 4 ft. 8 in.

886. Is that the authority upon which you made the statement?—Yes.

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887. Of the steamers which passed over Lough Derg?—No, I have a better authority.

888. But is your authority better than the return we have here?—I think it is a good authority.

889. This is a statement made in the Appendix to the Report of the Lords' Committee, in which it is stated that the whole of the vessels belonging to the company plying upon the Shannon drew from 5 ft. 1 in. to 5 ft. 4 in. of water?—I have the same column before my eyes at present. I will explain. If they were fully laden; that is to say, with about 60 tons; I dare say they would draw 5 ft. 4 in.; but they are seldom fully laden.

890. Mr. *Bonham-Carter.*] Then might not the owners of the navigation complain if an inability were created to load their vessels?—Certainly, we must not create such an inability; but what I am pressing on the Committee is this; according to that return which you are looking at, 5 ft. 4 in. is the greatest depth at anchor. Therefore we require but 5 ft. 9 in. on the lock sills; they require, he says, at full speed 6 ft. 2 in. We give them then another foot; we provide them with 6½ feet of water on the shoals and six feet on the lock sills; but to say that they require seven feet is mistake; it is the difference between six and seven feet on the sills that we are driving at.

891. Mr. *Gregory.*] Is the weir wall at Killaloe anything higher than was specified, in the first instance, by the Commissioners?—There are two things in the reports and plans regarding the weir wall at Killaloe. In what we call the cross-sections the weir is fixed to be six feet over the lock sill. The surface of the water also is fixed at six feet over the sill, and no more; therefore there is an inconsistency in that; they allow nothing for the water to pass over. Now it is stated in the reports, in several places, that what the Commissioners intended and wished for was to keep six feet as a minimum of water. They raised the wall to 6 ft. 9 in. in a most illegal manner, as we all can see; and the country devoutly hopes this Committee will remove that terrible grievance and violation of the law. When they raised it to 6 ft. 9 in., they also put another three inches of water on it, and at the very driest season of the year the water is a foot higher; there is no doubt of that.

892. At Killaloe?—Yes; and generally three feet higher than is warranted by the Act.

893. Do you know why the wall was so raised?—There really was no necessity for it. I assert that in the interests of the navigation it was not required.

894. Was you in the room yesterday when Mr. Forsyth stated, that in order to compensate for this addition to the height of the weir, it was extended 100 feet longer than the original plans, and thereby fully let off the amount of water which would have been let off if it had been constructed according to the original plan?—That is a mistake; it is not anything longer than is shown on the Parliamentary plans.

895. Not 100 feet?—It is not even anything.

896. Are you perfectly certain about that?—Quite certain.

897. Then you are directly at issue with Mr. Forsyth upon that?—I am.

898. Has much injury been inflicted by this alteration?—The raising of that wall in that illegal manner of itself has done thousands of pounds' worth of damage to the property on that level. I will tell you what it has done: the harvest before last I was on that level; I saw hundreds of acres of meadow swamped by a small flood, which did not go much out on the ground, but which so dirtied and destroyed the hay, that it was very greatly injured in the saving of it; for instance, the mowers and haymakers, every foot they laid down, brought up the mud, when the water was within an inch of the land. I saw several places where the lower part of the land was flooded six or eight inches deep. That occurs every spring, and frequently in the harvest there are three or four or six inches of flood; so that there is caused an immense amount of money damage to the crops; and there is that extra foot upon the weir at Killaloe put on in direct violation of the Act of Parliament. I thought it would not be fair to put the blame upon the Government for that illegal act by saying that they sanctioned such an act. I read through the 11 annual reports, from 1839 to 1850, since I came to this town, searching to see if there were any warrant for the statement that Her Majesty's Government had authorised the raising of that weir wall. I found it stated in one annual report, "We have set the contract for the works at Killaloe," but not a word about their going to raise the wall. In another report it is said, "The contract is executed;" and so on. In another it is said, "The weir at Killaloe will keep down the waters of the floods to the anticipated level." In another report they say, "51,000 yards still remain unexcavated. In a few more reports they say that 8,000 yards of these are cut out; but there is not a word in any of these reports saying, "We are going to raise this wall, or going to leave two feet in the bed of the river behind, or going to leave 100 feet on the Tipperary side."

899. Has the river been deepened at Killaloe to the extent delineated on the Parliamentary plan?—It has not been deepened nor widened to that extent; I measured it myself.

900. Can you show on the maps the amount that is left undone?—I do not think I could without some trouble; it is a literal fact; I pledge myself to the accuracy of it.

901. You say you have read over all these reports, and the documents connected with them; have you any evidence whatever to show that the Commissioners procured authority or sanction from the Treasury for these alterations and these omissions?—They were asked by the Lords' Committee to produce these sanctions, which they alleged they had. At the adjourned meeting they produced sanctions, and these are printed at the end of the Lords' Report. Now it turns out to be the fact they have the sanction of the Government for several alterations which they made, which were judicious alterations, and which they did very well to make.

902. One was the bridge at Carrick-on-Shannon, was it not?—Several matters they got sanctions for, and these were improvements; but as for the matters of which we complain, there is not an allusion to any one of them.

903. I understand you to say they were challenged by the Lords' Committee to produce authority on the part of the Treasury, and they failed to do so?—They were so challenged; they produced all they had, and it is stated in the Lords' Report. There is a passage which bears directly on it. I refused to believe that the Government

vernment ever sanctioned the raising of that wall.

904. Will you read the second paragraph of the Lords' Report to the Committee?—It is as follows: "That the plans approved of by Parliament for those works have been departed from in several instances, in a manner which has contributed to prevent their complete success. Furthermore, it appears that although the sanction of the Treasury was obtained for some of the deviations from the Parliamentary plans at and above Athlone, no record is to be found of any such sanction for the still more important omissions and deviations made below Athlone, nor were those omissions and deviations in any instance made known to Parliament, to the public, or to the residents in the localities.

905. Are you aware that that paragraph was unanimously adopted by the Committee of the House of Lords?—I could not say positively that it was. I think so. There is a very curious matter in addition. The point of land at Meelick, which was under discussion two days ago, which certainly was not cut away, in one of the annual reports it is distinctly stated has been cut away, amounting to so many thousand cubic yards, and it is not so.

906. Colonel *Vandeleur*.] It has been paid for?—The land was bought, and paid for.

907. Mr. *Gregory*.] With reference to the written paper put in by Colonel M'Kerlie; you do not consider that this paragraph is to be received unhesitatingly, in which he says, "That the recorded statement of such men as the late Sir Henry Jones and Sir Richard Griffith, as to these omissions and alterations having been sanctioned by the Treasury, should be accepted as entirely conclusive against the doubts and assertions that have been put forward by persons who could have nothing but supposition to support them"?—The Committee of the House of Lords called for these sanctions. There were several days' interval. The Secretary produced a certain number. We conclude there are no more in existence. But in regard to the faith to be given to these assertions, here is a plain case. There are in the Eleventh Report several matters, stated as facts, which are most decidedly wrong.

908. Then there is nothing whatever to show that the Commissioners made the Government aware of the fact that they were raising the Killaloe weir higher than shown in the Parliamentary maps?—Nothing whatever to show it. But as I mentioned just now, the Commissioners in several of their annual reports alluded to the works at Killaloe, that the contract was let, that they were going to do so-and-so, and that the weir would keep down the water to the prescribed limit. I read the eleven annual reports through, for the purpose of seeing whether it was in them or not, and I can assert that it is not.

909. Is there anything in any one of these reports to show that the Commissioners made the Government aware of the fact that they, the Commissioners, were omitting, or did omit, to deepen, or widen the channel at Killaloe to the full extent of the Parliamentary maps?—There is nothing whatever to that effect in any of the 11 reports.

910. Or at Meelick?—Nor at Meelick.

911. Or about placing the Victoria Lock nine inches higher?—There is nothing whatever in any of the reports conveying to the Government, that they intended to lay, or had laid the Victoria Lock nine inches higher that it was in the Parliamentary plans, nor six inches higher.

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912. Or at Tarmonbarry Bridge?—Nor for omitting to cut away the great island that obstructed the water at Tarmonbarry Bridge.

913. Or at Roosky?—Nor for not cutting away the Bird Island at Roosky; nor for omitting an immense amount of excavation at Roosky which they reported upon in one of the annual reports, and which I made a survey of; nor at Jamestown; I made a minute and accurate survey of the river from the weir at Jamestown up to the bridge, and I compared the plan and section, so made, with the Parliamentary plans; and I can assert that the work there is not at all complete, nor nearly so.

914. Mr. *Ormsby Gore*.] Those are works of omission?—Works of omission.

915. Was there not also a work of commission in putting an artificial obstruction in the shape of an eel weir at Roosky?—Yes; it has been said that that eel weir below Roosky weir cannot injure the upper level, because it is already so much injured by another weir, which is of little use at Tarmonbarry, and where there is always in the highest flood a clear fall of at least five feet; because that backwaters Roosky it is said there is no harm in putting an eel weir; but I took the level by a spirit level at the three weirs at Roosky, and I found that notwithstanding the backwater of Tarmonbarry, the eel weir at Roosky is an additional impediment, and a material one, in the passing of water from the upper level.

916. Mr. *Pollard-Urquhart*.] Was there not, also, a considerable amount of money spent in the purchase of lands and fisheries, not contemplated in the original Parliamentary plan?—Yes, but the amount of money is not easy to ascertain.

917. But there was money spent?—Yes, and its value can be ascertained in this way very simply. At present the rental received by the Commissioners of Public Works for lands, mills, and fisheries, amounts to about 1,200 *l.*; they have been receiving that since 1845 or 1850. Of course it must have taken a great deal to purchase that amount of property; if it were resold it would put the sluices in all the weirs.

918. It would put in the sluices?—I think it would.

919. Mr. *Gregory*.] If all the deepening and widening ordered by the Parliamentary plans to be executed at Killaloe, had been fully executed, and if the weir mound had not been raised above the hight proposed by Mr. Rhodes, what do you think would have been the advantage to the low lands above?—I have discussed that matter in figures after measurements made, and I am prepared to prove, in detail, that if the works at Killaloe had been carried out according to the Parliamentary plans, and if the weir wall had not been raised in this most illegal and destructive manner, no summer flood that has since occurred would have done any appreciable harm, except the floods of 1861, which would have damaged the very lowest lands only.

920. Mr. *Gregory*.] Do you remember whether Mr. Rhodes suggested any regulating sluices originally for Killaloe weir?—He did.

921. Did Sir John Burgoyne approve of them?—Sir John Burgoyne's letter to Sir John Cam

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Hobhouse in sending up Mr. Rhodes' plans, explains the views of the Government fully. Sir John Burgoyne writes, "Some doubts may perhaps be entertained as to the adequacy of the proposed dams to enable the superfluous waters to pass off with the rapidity on which he calculates, and whether it might not be desirable and even necessary to add extensive sluices, which would not only enlarge in a great degree the passage for these waters, but be always available to regulate the measure of discharge;" and Mr. Nicholson, in his valuation, stated that he understood that machinery would be used, so as to give a control over the flood waters at the weirs, and to keep down the water below the surface of the land.

922. Sluices were suggested by Mr. Rhodes?—And by Sir John Burgoyne?—And by Sir John Burgoyne.

923. Has Mr Beardmore, who has inspected the Shannon and reported upon it, also suggested sluices?—Nathaniel Beardmore, of 30, Great George-street, an eminent London engineer, who is an authority on these subjects at present, and whose book on hydraulics shows that he understands as much of that subject as any man in Europe, visited the Shannon at the request of Lord Clanricarde. He spent several days in examining the plans and reports, and in examining the river itself; and he made a report to Lord Clanricarde, in which he confirms all the views I have put forward.

924. Mr. *Gregory.*] You heard Colonel M'Kerlie state officially that the Shannon works were intended mainly and primarily to improve the navigation, and that the drainage was from the beginning merely an incidental circumstance. Do you gather that from the general reports?—I have collected into a paper a number of extracts which proves the contrary.

925. Mr. *Bonham-Carter.*] Are those statements in effect the same which you gave in to the Lords in your examination under Question 796?—Very nearly the same. If you read them you have what I intend to give you.

926. Mr. *Gregory.*] You heard Mr. Forsyth say that originally there were 32,000 acres flooded, and that 20,000 acres have been drained?—It has been said that 12,000 acres have been relieved by the Shannon works. Now if that were the fact, it would be a very great amount of good, and a most valuable result of the Shannon works, but it is not the fact. There never were 32,000 acres flooded by the Shannon in the present geological epoch at least. Mr. Brassington and I made a valuation, in which we agreed of each division of the Shannon from Castleconnell to Lough Allen head, as flooded and saturated in the winter of 1859-60. We took in that valuation not only the lands covered by floods, but we took all the lands that were supposed to be saturated by high floods which go to the height of two feet over the highest recent flood. We took in our saturated lands; we took in, in addition to those covered recently, all the land covered to within two feet of the level of the recent floods. Now there is no instance above Meelick of the old floods having been anything like two feet higher than the recent floods; therefore the former floods never covered the whole of our area of 24,000 acres. I do not know whether I make that clear.

927. You made an allowance?—The old floods should have risen two feet higher than the floods we were guided by to cover our saturated areas, as well as our flooded areas. I went over all the records of the Board of Works, and there was no instance above Meelick of any flood having risen in old times so high as two feet over; therefore the old floods never did cover 24,000 acres.

928. What area of land is now annually damaged by the Shannon?—The area of land annually damaged by the Shannon is about 25,000 acres, because we left out one division; we left out the Limerick division by special desire. We made the number of acres to within a fraction, 24,000, and there is about 1,000 in the Limerick division.

929. And in that calculation Mr. Brassington agrees with you?—Yes.

930. Can you tell me the damage done by the tributaries?—There is the River Suck which is said to flood 72,000 acres of ground, but which I do not believe.

931. You think that too large an estimate?—It is a great deal too large, but the lands on the Suck are very much damaged. They are more damaged every year than the Shannon lands, and therefore the benefit, acre by acre, on the Suck land will be more by taking off the waters, but the Suck cannot be drained till the Shannon is drained, because a committee of Suck proprietors laid a case before counsel and the opinion was that if they opened any of their outlets above, the owners of the Shannon lands would have an action against them. They stopped short therefore, and would do nothing more till the drainage of the Shannon is done.

932. I suppose lowering and draining the Shannon would have a very considerable effect as regards its tributaries?—It would. For instance, there is the case of Mr. Allan Pollok a very wealthy man who has purchased a large tract of land, and made immense improvements. Among other things for the improvement of his land, he top-dressed with lime a great area of his callows, after harvest. The flood came, and washed it all away. He has told me several times that he would rather than any moderate consideration this thing was done. Every time he meets me he calls out, "What will they do with the Shannon?" He says the country will never be in a proper state until the Shannon is drained. The feeling is universal upon this in Ireland; and there never has been, perhaps, a disappointment so great as there would be if this Committee were to separate without taking active measures for draining the Shannon.

933. *Chairman.*] The outlet of the Suck into the Shannon is not sufficient to discharge any portion of the flood waters?—It is not at present.

934. If the works that you propose at Killaloe were carried out, would there be sufficient fall to enable the lock to discharge the extra waters?—Yes. I hope the Committee will remember that the proprietors are more damaged and more irritated and annoyed by the small floods and by the saturations than by the large floods.

935. Mr. *Bonham-Carter.*] Except the summer floods?—It is in summer and spring that the lands are saturated.

936. Mr. *Gregory.*] You heard Mr. Forsyth's statement, the other day, with regard to the difficulties that existed, and which prevented the completion of the excavations at Meelick?—I did.

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937. The cutting at Meelick was deep enough, was it not?—Yes, it is deep enough.

938. Is it wide enough?—No. Mr. Rhodes proposed that they should double the sectional area of one channel. They did not double the sectional area of the one channel, but they did stop up the other; and the stoppage of the other is unnecessary for the navigation.

939. There is no cutting where the river should be widened?—They cut off part of what was intended, but the lock-splitting line is there still; it can be seen to this day. Not only so, but the Shannon Commissioners receive rent for a portion of those points of land that were to be cut away. They have them let to tenants and received rents for them in several places.

940. Have you any remarks to be made about Meelick?—With reference to the mound that did so much damage, I know this land particularly well, because it belongs to a friend of mine.

941. Colonel *Vandeleur.*] Do you know anything of the stopping of that gap?—I think I can explain it to you better on the map. I am very anxious on this subject. The mound against which we object so much, and so justly, is not shown upon any Parliamentary plan, nor referred to in any report. It is not necessary for the navigation, and I will tell you why. The ostensible motive for building it was to prevent water from escaping in dry summer weather, and lowering it too much for the steam navigation. The mounds are high enough to prevent the escape of water in summer, but they are not high enough to prevent it coming over in moderate floods; it then tumbles over and accumulates round the farm, which I was speaking of, as the best fattening farm in Ireland; and the flood water cannot escape except by a little pipe of about two feet by a foot and a half. After the flood has fallen in the river and left the land by it dry, the water still lies on this farm, because the bank is a little higher. I have seen it there.

942. Mr. *Gregory.*] What do you propose to do to remedy that?—I assert that this mound is of no use whatever to steam navigation. I took Mr. Bateman and Mr. Forsyth to that mound, and we three stood upon it; and said I to Mr. Forsyth, "Now, tell Mr. Bateman for what purpose did the Public Works Commissioners erect this mound?" He replied, "I think it was for a passage for the owner of this land." "Well then," said I, "I am the agent of the owner of the land, and on his part I beg of you to either take it away or let us cut a hole in it." I hope the Committee understand that it is not necessary nor useful for the navigation if any of them think so. I will go into it further. It is nothing but destructive of that ground. About two years ago they were going to tear it down, and the police were obliged to come and watch it.

943. It did so much mischief?—Yes.

944. Colonel *Vandeleur.*] How much would it lower the water if it were taken down?—It would not benefit above two or three farms. We will cut it at our own expense; what we want is to get leave to cut a gap about 20 feet broad in that mound.

945. Mr. *Gregory.*] Will you describe the level of the water in each division of the Shannon, and what advantage you think may be made in each for the good of the drainage, without injuring the navigation?—In the Limerick level I propose no alteration from the present summer level; in the next level, above Castle Connell, I propose no alteration from the present summer level; in the great level, from Killaloe to Meelick, I propose nothing more than that the level proposed and recommended by the five Shannon Commissioners, and sanctioned by an Act of Parliament, should be restored; and I assert that would be quite sufficient, and would entail no injury whatever on the navigation. In the division from Meelick to Athlone I propose no reduction whatever from the present summer level, because any reduction from the present summer level would injure the navigation. In the level from Athlone upwards I propose to reduce the summer level so far as Semcola; it would leave five feet of water on the sill instead of about six feet and a half, as at present; and I would propose to reduce the Carrick-on-Shannon and the Tarmonbarry levels to five feet of water on the sills; because the present navigation, I have ascertained as a fact, amounts to this, one steamer in a fortnight, carrying 40 tons.

946. That is from Athlone, all the way to Carrick-on-Shannon?—The steamer is from Athlone; it never carries more than 40 tons burden.

947. Mr. *Bonham-Carter.*] That is your view with regard to the best way of dealing with the drainage?—Yes; that is one part of my views.

948. And are the plans we have now before us drawn with a view to that reduction of five feet on the sills?—I did not propose that on the plans; I was afraid it would not be got, and therefore I did not put it on the plans. Without that reduction an immense amount of good could be done. The reason I wish the reduction is because the lakes are so extensive, that if there were merely a reduction of a foot, or a foot and a half, in anticipation of floods, the reservoirs would be so very valuable, and the water would still be deep enough for navigation.

949. Mr. *Gregory.*] Eighty-seven thousand acres is, I believe, the area of the lakes?—Seventy seven thousand, including Lough Allen.

950. How much land has been drained into the Shannon within the last 20 years?—Over a million acres; 23 great rivers have been cleared into it.

951. Has any enlargement been made in the outlets of the Shannon at Meelick to correspond with that drainage?—None whatever.

952. Is the outlet at Meelick more effectual at the present moment than it used to be?—The outlet at Meelick is not more effective than before the works, notwithstanding the tables that have been put in. It is a fact which you can see, from the recorded heights of the floods in the books kept by the Shannon Commissioners. The floods have frequently risen higher immediately above Meelick old lock, since the works, than they did before. That is shown in the returns of the Board themselves. There is another important matter. The present works at Meelick have raised the summer level higher than it was before; and that upon the lands which are very near the edge of the water is a great injury. A rise of six inches in the summer level is a very serious matter. It is not my assertion; the fact is here, in the tables put forward by Mr. Harding on the part of the Board of Works. If you look to page 86 of this book, you will find under the head "Hamilton's Lock, Upper Sill," that the average heights of the water, since the works, taking the average of several years, is in some months four inches,

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inches, in some six, and in some five higher; so that it is a literal fact that the summer level of the water in that part of the Shannon has been raised about six inches. The cutting away of the shoal was a very good work, and would have improved the outlet immensely; but the solid stone wall was raised then to such a height that it neutralised the effect of the excavation, and the result is, as I am prepared to show, in detail, if opportunity serve, that the outlet at Meelick is not more effective; I will not say it is not less.

953. In your report to the Government, you propose two plans, the cost of each of which is set forth, I think, in page 4. If the smaller plan were executed for 92,000 *l.*, which is your estimate; would that, in your opinion, yield full value for the outlay?—I am quite sure it would.

954. Could a more complete and effective work be afterwards executed, without any loss, or any alteration or removal of the first?—It could. A more complete and effective work could be afterwards executed without altering or removing any part whatever of the first; and there is this matter to be considered, viz., that the making of the regulating weirs in place of the present weir mounds would tell, and yield a profit by way of the improvement effected every year; whereas the additional expenditure for excavation, between 20,000 *l.* or 25,000 *l.*, and 150,000 *l.* will be required for a flood that is to come only once in 20 or 30 years.

955. Then your estimate of 92,000 *l.* contemplates the restriction of all ordinary floods?—I am prepared to prove that for this smaller sum of 92,597 *l.*, expended in the manner proposed by my plans and report, all ordinary spring, summer, and autumn inundations will be prevented.

956. Do you believe that expenditure of 92,000 *l.* will do that work as effectively as the larger expenditure of 290,000 *l.* proposed by Mr. Bateman?—No, not as effectively, because the sum in my estimate that is to be compared with Mr. Bateman's estimate is 143,000 *l.* for the larger work. I know that the smaller work would leave something to be done; but the great difference between the amount of Mr. Bateman's estimate and mine turns upon the point that he still leaves about from one-half to two-thirds of the natural surface-fall of the river wasted at his weirs; whereas, by the French system of weirs, we bring into action on the surface of the stream, to propel it forward nine-tenths of the natural fall.

957. Mr. *Bonham-Carter.*] Do you mean that when your weir is full open you have merely the thickness of the work, which you have placed at two or three inches, I think, as compared with the permanent face still exposed by Mr. Bateman's work?—Yes; I have calculated that the fall occupied and wasted by this system of sluice will not exceed three inches at Killaloe weirs. On his sections he lays it down at two feet for his weirs.

958. Mr. *Pollard-Urquhart.*] Do you conceive that the purchase of lands and fisheries made by the Commissioners, but which were not authorised by the plan originally submitted to Parliament, has been useful for drainage and navigation?—Not in the smallest degree.

959. Do you not conceive that if these lands and fisheries, which have not been in the smallest degree useful, either for drainage or navigation, had not been purchased, a very large sum would have been available for the completion of the excavations in the manner originally proposed?—Yes, a sum of about 20,000 *l.*; but it may have been, I think it was, judicious in several cases to purchase those lands which they required. They got at their work better, but they should have sold them when they had done with the works.

960. In your evidence before the Lords' Committee you allude to several cases in which the surrounding lands were considerably deteriorated; do you adhere to that opinion still?—Yes. The fact is this: there were two valuations made, under two Acts of Parliament, of the lands bordering on the Shannon; they were made under a Commissioner, viz., Sir Richard Griffith. Each was made on the basis of a scale or schedule of prices inserted in the Act. The prices in the first Act were lower for beef, mutton, and butter than the prices in the second Act; therefore land that preserved its intrinsic value from the date of one valuation to the date of the subsequent one, and which was meadow or grass, or fattening ground, should have been valued higher in the second valuation than in the first. The fact is, that the one valuation was made while the works were in progress, and I made a part of it myself; the other was made several years subsequent to the date of the execution of the works on that scale of prices which made grass lands more valuable; and notwithstanding that Sir Richard Griffith has valued several of these townlands lower since the works than before. Now that is not caused by the fact of his having been interdicted by an Act of Parliament from putting on the value of the improvement. The Act only relates, I think, to land improvement. In the case of land improvement you are not to put in the value of the improvement; but I, who valued for seven years on the general valuation of Ireland, and have been frequently spoken of by Sir Richard Griffith at public meetings (and Lord Inchiquin wrote to me and said he had frequently heard Sir Richard Griffith speaking of me), as one of his very best men, know perfectly well the practice and the rules that were observed in carrying out that valuation, and I know that they do not apply to the case of the Shannon; and notwithstanding, the valuation of all these townlands that I have given here, and which has been made several years since the works, is lower than the valuation was made while they were in progress.

961. Mr. *Gregory.*] Do you know the number of tons that are carried annually over the Shannon?—I do not know it, but it has been returned as 29,000.

962. Do you know the amount carried over the Seine?—M. Beaulieu, the engineer-in-chief of the Seine, gave me a note saying, that the navigation on the Seine amounted to 600,000 tons; and my object in going latterly to see the weirs of the Seine was to ascertain, personally, whether they had got out of order since I saw them three years ago, whether they had been at at all interfering with the navigation, or whether any objections had been made to them. I found that they had not.

963. Mr. *Ormsby Gore.*] Can you give me any information, with reference to the 29,000 tons carried on the Shannon, as to what proportion is carried above Athlone, and what proportion below?—I can tell you very correctly the amount of traffic on the Shannon, above Athlone, in the Grand Canal Company's boats. About once a month

month 40 tons of flour are sent up, and that is the entire.

964. Mr. *Bonham-Carter.*] You have been asked questions with reference to the two valuations of Sir Richard Griffith; are we to understand that you believe, from your own knowledge and your own personal professional experience, that the lands referred to are actually of less value than they were before the works? — In that one division, or part of a division, between Meelick and Athlone, I am quite sure that the lands are somewhat injured; but in the other divisions of the Shannon I do not think it is the case.

965. You, as a professional man, can put it somewhat into figures; are the lands injured to such an extent that if you were called upon to lower the rents of the occupiers you would take anything off?—I do not think they are injured to much extent. It is not much, it is only just a point.

966. Then we understand that, on the whole, the explanation you have given of the valuations does not lead to the conclusion that the lands referred to are of less value than they were previous to the works? — With the exception of those three or four townlands I think the valuation is wrong.

967. Mr. *Gregory.*] Do you mean that the valuation is wrong by being too high or too low?—It is wrong, both in one way and the other.

Monday, 11*th May* 1868.

MEMBERS PRESENT:

Mr. Sclater-Booth.
Mr. Bonham-Carter.
Mr. Agar-Ellis.
Colonel French.
Mr. Ormsby Gore.
Mr. Gregory.
Sir G. Montgomery.
Mr. Pollard-Urquhart.
Colonel Vandeleur.

COLONEL FRENCH, IN THE CHAIR.

Mr. J. F. BATEMAN, called in; and Examined.

Mr. *J. F. Bateman.*

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968. *Chairman.*] ARE you a Civil Engineer?—I am.

969. The works upon the River Shannon, and the memorials of the proprietors adjacent to the river, have been, I believe, twice referred to your consideration?—They have been. I was required to ascertain primarily whether the works which have been constructed by the Shannon Commissioners had had any influence upon the flooding of the land above their various works, to inquire into the causes to which the floods were attributed by the landowners, and then to ascertain whether any measures could be adopted which would have the effect of relieving the lands from floods. I believe those questions were essentially what I was called upon to determine.

970. In both references?—No; in the first reference.

971. Mr. *Sclater-Booth.*] Will you give us the date of that?—It was from instructions received from the Treasury in July 1862; I reported in May 1863, having held, for the purpose of determining the questions referred to me, five public courts of inquiry at Limerick, Banagher, Longford, Athlone, and Carrick-on-Shannon.

972. And having personally yourself examined the river?—Having personally myself examined the whole river from one end to the other, and ascertained all the facts that appeared to me to be material for the purpose of reporting; and I did report upon that information in May 1863.

973. *Chairman.*] You made two reports?—Yes; the second report was made in virtue of instructions received subsequently by a Treasury Minute of May 1866. Those instructions were of a very comprehensive character. They required a full investigation of the subject, with careful designs, and quantities and prices of each work, for the purpose of devising what works were necessary for the complete drainage of the lands adjoining the river between World's End, below Killaloe and Lough Allen; and in compliance with those instructions, I made the report, which was accompanied by extensive plans and full detailed drawings and estimate, on the 7th of June 1867.

974. Could you give us the purport of each of those reports?—I can give you, I dare say, shortly, the conclusions. You will find in the copy I have handed in, all the evidence given before me at the various courts of inquiry to which I have referred, which was not printed with the report, as it was desirable it should have been; but you will find in the report you have before you, that I have summarised the principal heads to which my attention was directed. "First, the extent of flooded land and the height and duration of the floods, and the seasons in which they occur. 2nd. The causes to which the floods are attributed by the landowners. 3rd. Whether the injuries complained of have been aggravated or mitigated by the execution of the works for the improvement of the navigation of the river under the Shannon Commissioners. 4th. The measures practicable for confining the flood-water within the natural channel of the river, or for lessening the injuries complained of, having regard to all the interests involved; and 5th. The cost at which such measures may be carried out."

975. Have you seen the original plans and estimates which were prepared for Parliament prior to the commencement of the works under the Shannon Commissioners?—I have seen all the reports and all the documents, so far as they are Parliamentary documents.

876. In your opinion as a professional man, was three years, which I think is the time the preparation of these Parliamentary plans was going on, sufficient to enable the Commissioners to have prepared correct plans and accurate estimates as to the works they were about to produce?—I should think three years were sufficient; everything then had to be done under greater difficulties than recently, because the Ordnance Surveys were not then complete of the whole of Ireland.

977. No, but you had the surveys of Mr. Rhodes and of Mr. Grantham, and the reports upon the orders that they had?—Yes; and inasmuch as I did the whole that I had to do in less than three years, I should imagine that the whole work might have been sufficiently investigated in three years.

978. There is, according to your report, deficiency in the execution of these works for which you consider that a sum of 283,000*l.* would

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would still be required to finish them?—I do not think I reported that.

979. Will you state then, generally, what sum you report to be required in your opinion for the execution of the works as originally proposed?—That I never considered; I never had occasion; it was never remitted to me to consider that. I had to consider first, with reference to the Shannon Navigation Works, whether they had had any influence in causing the inundations complained of at the time I was instructed to report; and I came to certain conclusions upon that, which are stated in the report, from an examination of the district and the plans and the evidence that were before me. And then I was requested to report what sum would be required for the effectual drainage of the whole of the valley or basin of the Shannon, and that sum, in the first report, I think I estimated at 283,000 *l.*

980. And in your second report, I think you have adhered as closely as possible to that estimate?—Essentially; there are a few alterations, minor alterations, but essentially, with one exception, all the designs, or rather all the suggestions, which I made in the first report, were ultimately found on consideration to be best adapted, in my opinion, for attaining the object; and my estimate is a little higher in my second report than in my first.

981. You say that it was not part of your duty to inquire whether it was worth the while of the proprietors to undertake those works?—No, that I was not requested to do; I was merely requested to determine what was requisite for effectual drainage, and to ascertain the cost.

982 Mr. *Bonham-Carter.*] Effectual drainage without interfering with the navigation?—Without interfering with the navigation. Might I read the special instructions under which I had to act? I was first appointed for the purpose of making inquiries, and a report in reference to injury stated to have been done to certain properties in Ireland by the flooding of the River Shannon; "And for the purpose of guiding you in the investigation of complaints, in making inquiries on the spot, and in drawing up your report, their Lordships are pleased to issue the following instructions, namely: 1st., you will satisfy yourself as to the extent of land over which the floods ordinarily spread, the height to which they rise, and their duration, and the seasons at which they occur; 2nd., the causes to which the floods are attributed by the landowners themselves; 3rd., the effect of these causes, as regards extent of injury, as compared with the effect of causes existing previous to the execution of the works for the improvement of the navigation of the river under the Shannon Commissioners; in other words, whether the injuries complained of have been aggravated or mitigated by these works; 4th, the measures practicable for confining the flood-water within the natural channel of the river, or for removing or lessening the injuries sustained or complained of, having regard to the effect to be produced on other lands; 5th, the cost at which such measures may be carried out. In making the inquiry, under the first three heads you will in the first instance make yourself intimately acquainted with the general aspect, peculiarities, and condition of the river, in its whole course from Drumshambo to Limerick, and then proceed to receive the statements of the landed proprietors, and the evidence of such persons as they may desire to bring forward, making such inquiries of them, or from other persons, as you may think proper. The Board of Public Works, Ireland, will be ready to afford all the information within their power, both from the plans and records in their office, and from their own knowledge and experience, as well as from their officers and servants, or other persons, whose evidence they may consider it desirable to adduce; and you will receive such information at such time and in such manner as you may deem most convenient. In considering the subject under the fourth and fifth heads, you will bear in mind that no measures can be entertained which will have the effect of prejudicially affecting in any way the public interests in the navigation, which is secured to the public as set forth in the Minute of the 30th of May, under the authority of an Act of Parliament; and further, it will be imperatively necessary that the works of improvement to be submitted shall be so designed that no lands on any branch or reach of the river shall be liable to increased injury in consequence of relief to be afforded on reaches contiguous." So that my investigation was confined without reference to whether it was worth the while of the landowners to undertake the drainage or not, to the extent of land which was affected by inundations, the causes to which they were attributable, and the measures practicable for confining the river to its natural channel, or to a channel having special regard to the maintenance of the navigation as it was.

983. Do you see any reason why the proprietors adjacent to the river should be called upon to contribute anything for the non-fulfilment of works entrusted to the Shannon Commissioners to execute?—I have never been asked that question, and I never reported upon it; it never formed part of my instructions to inquire into it. As matter of opinion, I do not suppose my opinion would be worth much.

984. Your experience is very valuable; you have had a good deal of experience, I suppose, in the execution of great works in this country, and in other countries?—I have.

985. You are fully aware of the principles which have generally governed the execution of those works?—Yes.

986. Are you aware of a body of men entrusted to prepare plans, and to estimate the cost of works, ever having been entrusted with the execution of the works they have prepared an estimate for?—I am not quite sure that I understand your question. Do you mean whether the same parties who had prepared the estimate should be the parties called upon to execute the works?

987. Yes, to execute them?—I cannot answer that question; I think that is not unfrequently the case. I do not at this moment recollect a parallel case to that of the Commissioners.

988. Can you give us any instance in any country where it has been done; where, without any control, the parties who laid out the works, and estimated their cost, were entrusted with their execution?—If I may venture to explain my views in this case, the body of the Commissioners did not make the estimates; they employed their engineers, and they depended on the estimates made by the engineers. Those were all submitted to Parliament, and they had the control of Parliament; I do not see that the Commissioners

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were the parties who estimated the cost of the works.

989. You do not conceive that they were?—I do not see it; I may be wrong, but I do not see that in this case the Commissioners appointed for carrying out the improvements to the Shannon, were the parties who estimated their works. If I remember rightly, the estimates were made by Mr. Rhodes, and by engineers officially appointed and employed by the Commissioners, who were themselves put in the position of the executive. I may, perhaps, venture to say that I do not see any great distinction between the powers granted to the Commissioners of the Shannon and the powers granted, for instance, to the Water Commissioners or the Corporation of Glasgow, for the carrying out of works for the supply of Glasgow with water from Loch Katrine. A Committee or Commission was appointed, who were masters of the position as long as they were in office; they had estimates prepared, they acted upon those estimates; they had the power of levying rates, and they acted upon that.

990. Mr. *Sclater-Booth.*] I think the Government did not, in that case, contribute half the cost of the works?—No; but there was a body existing with very large powers; and it is frequently the case in many other instances.

991. *Chairman.*] Do you consider from your knowledge of the Shannon since 1863, that the plans approved of by Parliament were carried out?—I never was called upon to ascertain whether they were all strictly carried out. I was to take the improvement of the navigation as an accomplished fact, and to enquire whether, it being an accomplished fact, it had increased or diminished the liability to flooding which had previously existed. There I took up the inquiry, and I never ventured to go further. I was not called upon to do it, and I should have been going beyond my instructions if I had done so.

992. In your report of May 19th, 1863, at page 6, you state that arterial drainage has increased the rapidity with which the waters rise in the Shannon?—Do you mean the drainage carried out in the basin of the Shannon?

993. Yes?—"Before determining the maximum flood to be provided for, it is necessary to consider the effect of the arterial drainage. There can be no question that the drainage which has been carried out in the basin of the Shannon has materially facilitated the escape of water from the drained districts, and has thus increased the rapidity with which the water rises in the Shannon, and the volume of water in times of flood. It would appear also as a necessary consequence that the river is rendered more liable to summer floods than it was previously." That is my opinion still.

994. I want to know what you would think of the statement in opposition to that, that arterial drainage will cause a slower discharge of water. That is the statement of Mr. Forsyth?—I do not quite know that I clearly comprehend the question, because it depends so much upon the conditions under which the answer was given. It is a compound question. There can be no question that every district which is drained must discharge its waters more rapidly than it previously discharged them. But when you are treating a very large tract of country, such as the 2,650,000 acres of the whole basin of the Shannon, I presume the argument was that the rapidity with which the water would be discharged by certain districts at a lower point before the more rapidly discharged water of a higher district would come down to it would prevent the occurrence of floods. That may be, and would be the case; but it would follow that the main channel for the discharge of the water more quickly poured into it should be capable of carrying it away.

995. Mr. *Ormsby Gore.*] This is the evidence, as given by Mr. Forsyth:—"*Q.* Since 1850 have there been any arterial drainage works carried out?—*A.* Yes. *Q.* Having their outfall into the Shannon?—*A.* Yes. *Q.* In consequence of those works does not the water come down more rapidly into the bed of the Shannon?—*A.* Experience shows us that there has been very little increase, if any at all; in fact, in one instance which I worked out, and which I gave in evidence before the Committee of the House of Lords, the water is now lower since the arterial drainage has been completed than it was before." If you will turn to page 6 in your report of 1863, you will find you say, "There can be no question that the drainage which has been carried out in the basin of the Shannon has materially facilitated the escape of water from the drained districts, and has thus increased the rapidity with which the water rises in the Shannon, and the volume of water in times of flood. It would appear also, as a necessary consequence, that the river is rendered more liable to summer floods than it was previously." Is that correct?—Yes; and my deliberate opinion too.

996. Can you qualify that answer in any way?—In this way. If you read near the bottom of that page, you will find I say, "These calculations are made" (after going into some calculations as to the probable result from the drainage of these districts) "are made on the supposition that the whole rain basin is alike affected by rain, and each tributary discharging its maximum flood at the same time."

997. And thereby summer floods are caused?—No, not caused, but they might be increased in volume for the time. They would come more quickly, and pass off more quickly.

998. In that same page you say, that 1,221,323 acres out of the 2,560,000, which is the rain basin above Killaloe, have been drained?—Yes.

999. And that more have been reported on with a view to drainage?—Yes.

1000. If those additional acres are drained, will not that tend still more to increase the floods?—Yes, I have gone into that calculation. I have analysed the drainage district still undrained, and I have estimated that if those were drained, which are capable of being drained (some are not, some are mere mountain districts), the result would be that it would add about 250,000 cubic feet of water per minute to a quantity at Killaloe of 1,000,000 or 1,200,000; about a fifth portion of the whole quantity of water we should have to deal with, in such a flood as occurred in August 1861.

1001. And if the outfall at Killaloe is not improved, it will still more endanger the crops in that reach of the river?—If the outfall at Killaloe remained unaltered, there would, of course, be a greater height to some extent in the depth of water passing over the weir.

1002. Then am I right in drawing the conclusion that it would be better to withhold any further

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ther arterial drainage works until the outfall at Killaloe has been improved? — No; I do not think that, because the rise of a few inches in the River Shannon under the peculiar circumstances of the district, are as destructive as a rise of many inches. The water in many parts of the district (it is not, perhaps, universal, but very nearly universal), the ordinary level of the water, is so near the surface of the land that the rise of a few inches would be attributable to a very small flood, and would go upon the land adjoining, and after that a rise of a few feet would do very little more harm, the crops being already spoiled.

1003. That would be the case in such a flood as that of 1864; but suppose a mere rainfall?—In the great flood of 1861, the land was four or five feet under water. For instance, in the district between Meelick and Athlone. Now, if one foot out of the four or five, or if only ten or six inches, had risen, the land would still have been under water to a very considerable extent, because it is almost a dead level on either side.

1004. In summer, if the water is two inches above the level of the land, it causes an immense deal of damage to callow or meadow land, does it not?—No; the land is generally from 15 to 20 inches above the level of the water, and a flood will rise to that extent before any damage is done.

1005. But two inches on that level would do immense harm?—Two inches above that level, if the water then begins to go over the ground, will of course do harm.

1006. Would it not be desirable to check the arterial drainage, so far as to prevent that degree of flooding?—I can hardly answer that question. It is one that would require a great deal of consideration, because I should then have to consider at what point the land would really begin to be injuriously affected. The flood of 1861, which consisted of a volume of water at Killaloe of about 1,200,000 cubic feet, in a minute, and proportionately all the way up, covered the land in many districts four or five feet, and I should have to consider what quantity of water could be sent down before any injury would be inflicted; and I could not answer that question at present; but of course every increase, where a thing is so nearly a balance, renders the liability to flood more imminent.

1007. *Chairman.*] You investigated, and I think you report a good deal about, Carnadoe Bridge?—Not a good deal; I mention it.

1008. Mr. Forsyth states that the bridge of 45 feet space will pass as much water as the old bridge with 53 ft. 6 in. water-way. You have stated your opinion upon that?—I have not. Not upon that.

1009. Will you give us your opinion upon it?—It depends on the depth of the water. A bridge with 53 feet span may not be able to pass as much as a bridge with a 45 feet span if the depth is not the same.

1010. That was the original plan, was it not?—I do not remember.

1011. In your report, you state that another arch of 35 feet, in addition to the one already constructed of 45 feet, would give 70 feet of water-way; very nearly what the Commissioners arranged, and what you report to be in your opinion unnecessary?—I am afraid, if you will allow me to say so, you have not quite given what I say correctly, because I do not refer to the present width. I say: "Above Roosky another arch of 35 feet span must be added to the existing one over the Carnadoe water, and the approaches properly cleared out and deepened." That is my opinion; but I have not given any with reference to the existing bridge. The water space there, whatever it may be (it is not mentioned), is not, in my opinion, sufficient to discharge the water of floods without impounding it to an inconvenient height above the bridge.

1012. Which would raise the water a considerable height, and do very much towards the flooding of the river?—The object of increasing the waterway of the bridge is to reduce the water to a height consistent with safety from floods.

1013. I do not know what you report about it, but you examined particularly, did you not, into the Clerhaun Cut, that was estimated at 170 *l.*, in the original estimate, but upon which we state that 8,000 *l.* has been expended.

1014. Which cut is that?—I do not remember the name; if it was a shoal once, it has ceased to be a shoal now, because it has not come under my observation; if it had, I should have reported upon it.

1015. Mr. *Sclater-Booth.*] I should like to take you back rather to the general question; in your first report in answer to the instructions which you received as regards the navigation works, you stated, did you not, that in your opinion taken as a whole, they were satisfactory?—That the navigation was a very complete navigation, and that the works had been well done.

1016. Can you understand that in works of that extensive character, considerable deviations from the original plan might well have occurred?—Yes.

1017. But it was no part of your business to test the authority upon which any deviations, if such were made, took place?—No; it was not any part of my business.

1018. In your experience, are not works of this large character subject to deviation as they go on?—Yes, all works are liable to deviation, and river works are especially liable; you are very likely to require deviations when you come to execute them; it is very frequently impossible to ascertain, the character of the ground you have to deal with in the first instance, until you go into it. Deviations may be required on that score; the foundations may necessarily have to be carried deeper.

1019. But deviations or no deviations, and whether the deviation were authorised by the Government or not the works as a whole were, in your opinion satisfactory?—Yes, it was a complete navigation, varying in dimensions, but a complete navigation from one point to another, and the works were certainly very well executed.

1020. It does not, therefore, follow however, that no improvement could be made in the navigation?—No, nor whether they were strictly carried out according to the original plans; I cannot say as to that, because it was not part of my business to inquire.

1021. Mr. *Gregory.*] You confine your remarks solely to navigation, and do not include the drainage?—I understood the question to apply to navigation.

1022. Mr. *Sclater-Booth.*] You were also desired to inquire whether in your opinion the execution

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execution of the navigation works had caused injury to the drainage of the adjoining lands?—Yes, that was one special branch of the inquiry.

1023. What was your general opinion upon that point?—My opinion upon that point was, that comparing the state of things as I found them, and as they were stated to be before the execution of the works, no injury had been done by the works, and in many cases material benefit had resulted.

1024. Mr. *Pollard-Urquhart.*] As far as drainage was concerned?—As far as drainage was concerned.

1025. Mr. *Sclater-Booth.*] Can you, however, account to any extent for the increased bitterness of the complaint with regard to the injury caused by flooding since the execution of the works; I mean, can you conceive that lands relieved, or that were expected to be relieved, became cultivated with more expensive crops, and therefore the injury done to them by inundations since the works were established might be more keenly felt and more loudly complained of than they would have been in former days?—Yes, that certainly was the case, and that was well expressed by a gentleman, Mr. Bourne, if I remember aright, who gave evidence at Carrick-on-Shannon, which I think you will find in the report at the bottom of page 4.

1026. Will you read it?—"The relief given to the land has in many parts been so great that, as was well observed by Mr. Robert Bourne, in his evidence at Carrick-on-Shannon, 'persons were tempted into a false security, and put crops into low-lying land which were never cultivated before, so that when the floods came on in 1861, the loss was far greater and more severe than if these lands had not been tilled'; it is as well to quote his own words, because his evidence was very well expressed, and I had evidence of that kind, more or less, of the whole valley of the Shannon."

1027. Mr. *Gregory.*] That people were in more security; was that his observation?—Quoting his own words, persons were tempted into a false security. Lands which were periodically flooded before the execution of the works, were so seldom flooded afterwards that they calculated upon their being prospectively free from flood, and therefore they put crops in the ground which they would not otherwise have put in, and then when a flood did come it cleared those crops away.

1028. Mr. *Bonham-Carter.*] Then when a flood did come? Yes, but was not that a very exceptional flood?—The flood of 1861?

1029. Yes?—A very exceptional flood occurring at the time at which it did; and the rain of that year was 33 per cent. greater than the average rain of other years.

1030. Do you confine it to the year?—Not only to the year, but in the particular months in which the flood occurred it was still greater. I will give you the rain returns from a considerable number of places. If the evidence does not come out of place, you will find at the end of my report of 1863, in Appendix B. observations on the fall of rain in the summer and autumn months of 1861.

1031. Mr. *Ormsby Gore.*] May I ask where the gauge was kept that this evidence was taken from?—There was no gauge kept except at Killaloe; there was no gauge kept within the basin of the Shannon itself, and therefore I had to get the information from various places, I got it from Lord Rosse, from Lord Enniskillen, Dr. Robinson of Armagh, the late Mr. Cooper, of Markree Castle, Dr. Curtis, of Queen's College, Galway, Mr. Kane, of Tullamore, and the Rev. Charles Mayne, of Killaloe; so that I had it from a great variety of places. "Several of these places are not within the Shannon Basin, but they are near enough to be taken as some guide for the rainfall; and they may be assumed as correctly representing the relative wetness or dryness of different periods, and it is for this purpose that I more especially refer to them. By glancing the eye over all these tables, it will be seen that the remarkable peculiarity in the rainfall of 1861 was the extraordinary quantity which fell in the harvest months of the year. In Galway, it amounted in July, August, and September, to 56¼ inches out of a total fall for the year of 57⅔ inches. In no other year during the 11 years of which we have records, did it amount to half this quantity during the same months, except in 1851, when there fell $17\frac{4}{10}$ inches. At Markree Castle, we have 12 years records; here the rain in the three months named in 1861, was 18½ inches, the total rain for the year being a little over 47 inches. This is 80 per cent. greater than the fall in these months in any other year except 1859, when the rain was 13 inches, being still 5¼ inches less than 1861. At Florence Court the rain in the three months in 1861 was 21⅔ inches, considerably more than twice the fall in the corresponding period of any other year during eight years' observations, except in 1859, when there fell 13 inches, being still less than two-thirds of the rain in 1861."

1032. In what basin is Florence Court?—Lough Erne, a little to the north of Lough Allen. "At Killaloe, the Rev. Mr. Mayne has supplied me with 17 years observations; here the autumnal rains seem on several occasions to have been very heavy, but in no case do they approach that of 1861 In this year, in the three months of July, August, and September, the rain was 23¼ inches. The greatest previous falls in the corresponding period were 18½ inches in 1848, and 16¼ inches in 1859. At Tullamore, where we get into a district of much smaller rain-fall, and which lies in the middle of the Shannon basin, the rain in the three months of July, August, and September 1861, was 13·86 inches. The observations extended over 15 years. In the year 1848, the rain in the corresponding period was 11 inches: and in three other years, namely 1849, 1851, and 1859, it amounted to about 8¼ inches. In the remaining years the rain in no case amounted to more than half that in the months named in 1861. At Armagh, Dr. Robinson has kindly supplied me with returns extending over 23 years. The rain during July, August, and September of 1861, was 50 per cent. greater than in any previous year during this long period, and, with the exception of seven or eight years, about double the greatest falls in the same months."

1033. Mr. *Sclater-Booth.*] Then you refer to two or three other places. Let me ask you again, speaking generally, having made a certain report in the year 1863, as to what in your opinion would be required, namely a sum, in round numbers, of 300,000 *l.*, to relieve the lands adjoining the Shannon completely from injurious flooding,

flooding, has that, in your opinion, been confirmed by your subsequent experience in 1866?—It has. My estimates for the work in 1866 and 1867, came to rather more than the estimates in 1863. My last estimates are made upon most complete surveys, as accurately, and as completely taken, as if the work had to be let.

1034. What is the general reason why so great an expense must be gone to?—Because the river itself is not equal to the conveyance of the flood waters; the channel is not large enough to carry the flood waters away without their overflowing the banks.

1035. Therefore in order to afford a complete outlet for the water of the basin, the channel of the river itself requires enlargement?—It must be enlarged. That is well exhibited in the case of the river betwixt Meelick and Athlone, which is the most flooded district. There you have, in the whole distance betwixt Lough Derg and Athlone, at the foot of Lough Ree, only about four inches of fall in a mile, including everything. There are only 15 feet of fall or thereabouts, and the distance is 44 miles; now supposing there were no weirs and no locks, such a fall is quite insufficient to convey the water of a heavy flood away without its overflowing the banks; and the consequence is that it rises over all the banks, and overtops, the level of Lough Ree. Although there is no weir, nor any material impediment, nor such as are natural, except at Meelick, where there is a natural bar of rocks, the water in 1861 rose to a greater height than the ordinary level of Lough Ree.

1036. Does it follow from what you have stated as to the natural condition of the channel of the Shannon being insufficient to carry off the waters of the basin, that the placing sluices in weirs, or even the removal of weirs, would not be sufficient to produce appreciable results, except in the immediate localities of the weirs themselves?—If the weirs were entirely removed, and so the navigation destroyed, beneficial results would be immediately felt above the places from which they were removed, but those would die away, because the channel of the river is not large enough to correspond to the advantage in that way derived; and I think that in my second report, I specially refer to that. I have said in that report, "I have found little to alter in the general design or material features of the scheme which I sketched out in my report of 1863, and though I have endeavoured in every possible way to reduce the works and their probable cost, I have been unable to do so, having regard to the end to be obtained. In no case can the surface of the water be brought down to and maintained at the levels necessary to preserve the adjacent lands from inundation, except by the introduction of sluices at the weirs, which, in many cases, as at Meelick, at Athlone, and at Tarmonbarry, must be so adjusted that they shall be capable of discharging the whole volume of the river without permitting the water to rise many inches above the present level of the weir. The effect of this will be generally to reduce the depth of water several feet at and immediately above the weirs; it is obvious that if nothing more were done, such a reduction in the sectional area of the channel through which the water would have to pass, would require a greater velocity to convey the same quantity of water through the smaller channel. This increased velocity can only be obtained by increased declivity, and it therefore follows, that the mere introduction of sluices, while it would relieve the lands immediately above the weir, would gradually lose its effect as the distance increased, and would produce little or no benefit in the upper portion of a long reach, while at the same time it would so increase the velocity of the stream, as injuriously to affect the navigation; hence no effective relief can be given except by such enlargement of the channel at all shallow and contracted parts as will reduce the declivity, and consequently the level of the water, so that the lands adjoining the upper reaches shall be freed from floods, and that the velocity shall be consistent with the maintenance of the navigation. The necessity of meeting all these conditions has required very extensive and accurate surveys, and has postponed the determination of the precise works required until all these surveys were completed." I need not read further than that.

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1037. I think this brings us to the point where it may be said generally that your report differs on principle from the report of Mr. Lynam?—I do not like to make comparisons, but Mr. Lynam has attributed much too great a beneficial result to the mere introduction of sluices.

1038. That is what I mean. In connection with that let me ask you, should you say his estimate of the quantity of water to be dealt with was correct?—No; Mr. Lynam has underestimated the quantity of water to be dealt with. He gives in his report the means of ascertaining the mode by which he has determined the quantity; he speaks of the quantity of water at Meelick. If I remember rightly, he gives the weir as 1,100 feet long, and the depth 2 feet 8 inches; and at page 11 of his report, he says, "and the quantity which passed over Meelick Weir on the 22nd of August 1861, calculated by the most approved rule was 550,000 cubic feet per minute." In another place he gives the dimensions: "The quantity of water passing over Meelick Weir on the 23rd of August 1861" (which is, I suppose, a different time), "when the head was 2 feet 10 inches over the weir 1,100 feet long, I estimate at 555,000 feet per minute, and with the greater head of 3 inches, the quantity would be 643,400 cubic feet per minute." That is a repetition of the same statement. Now I find that he has calculated that according to the tables printed in Mr. Beardmore's hydraulic tables, which are true enough for certain weirs where they are fed from still-water lakes, or from reservoirs; but are totally inapplicable, and do not state the truth when applied to rivers in flood. The velocity of approach has to be taken into account, and according to these tables no deduction, or no accurate deduction can be arrived at. In fact, the use of hydraulic tables of that kind is often very mischievous; unless you know the conditions under which they are to be applied they mislead people; and I know of no formula, nor does any one else, by which the velocity of water in such circumstances as the River Shannon, can be determined. You must actually measure the water; and for this purpose I sent down a very competent assistant, two assistants, in fact, to measure the water in flood wherever it could be conveniently done. Two places were selected, one at Meelick, the other at Killaloe. The river was divided into sections at certain distances; wire ropes were strung across; the levels were taken most accurately;

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accurately; and cross sections of the river; then the velocities from one to the other were taken, the superficial velocity, the bottom velocity, and the mean velocity, and from that the actual quantity of water was determined. It so happened that the floods rose to nearly the same height during those observations as in August 1861, so that I was enabled to ascertain almost the exact quantity of water that flood sent down. My calculation above Meelick was 620,000 cubic feet of water in a minute; if I had taken the same calculation which Mr. Lynam did, I should have made it 471,000 only. So that the quantity which he supposed he had to deal with is very much below the quantity which he would really have to provide for.

1039. About 25 per cent., in fact?—Something like 25 per cent.

1040. Mr. *Ormsby Gore.*] Can you tell me the date of your assistant's experiments?—They were made in the winter of 1862-63.

1041. Or 1863-64?—No, February 1863.

1042. Mr. *Gregory.*] Can you put in the figures upon which those calculations are made?—I can do it if you wish it.

1043. Are they not in the report?—They are not in the report; of course, one of the most important elements for consideration was the actual quantity of water which we had to deal with; I have taken Mr. Lynam's own figures; he has given me 1,100 feet as the length of the weir; he has given me 2 feet 10 inches as the height, and he has given me a certain quantity of water; he has extracted the square root of the full height; I do not know whether he has done it in that way, but he may have done it so; multiplied that by five, and taken two-thirds of the quantity for the velocity, which is the ordinary rule, and the rule upon which Mr. Beardmore's tables are compiled; therefore, whether he has made his calculations upon that rule, or upon Mr. Beardmore's tables, is immaterial; but that rule is not true as applied to these circumstances.

1044. Mr. *Selater-Booth.*] But at all events you have taken the measurements as a matter of fact, and you have found the results as you have described?—Yes.

1045. To go a little more into detail; with reference to the proposal as to sluices in Mr. Lynam's report, are you of opinion that they would produce the result which he expects from them?—No, neither his sluices nor any other sluices would produce the effects which he expects from them; a great deal more than the erection of sluices, and a great deal more than what, as far as I can gather from the report (it is not very great detail), Mr. Lynam prescribes, would have to be done in order to enable the river to convey the quantity of water it must convey without flooding the adjoining lands.

1046. Are you acquainted with the cases to which Mr. Lynam referred, in which the sluices have been constructed in some rivers in France?—Yes; I do not know how far that model is sufficient to represent what Mr. Lynam requires, but it is absolutely unworkable in that shape; he did not very clearly describe it; he merely exhibited it, and stated that for 420 feet across the river at Killaloe he would put these in, 7 feet deep and 5 feet wide, and the lock-keeper would throw first one over and then another; they would be horizontal, and then he would get them back again; but he did not describe to us how they got back again; now they could not be got back again, except by the introduction of machinery, which it would be extremely difficult to introduce until Lough Derg was as low as it could run out, or until the river below had acquired the same level as Lough Derg above.

1047. Mr. *Gregory.*] Did you not say, Mr. Lynam, that you raised one of them with your hand?

> Mr. *Lynam.*] I raised one of them from its flat position under the water.
>
> *Witness.*] That was in the Seine?
>
> Mr. *Lynum.*] In the Seine.
>
> *Witness.*] Not at Lough Derg?
>
> Mr. *Lynam.*] I wish I could do the same at Lough Derg.

1048. Mr. *Gregory.*] Did you not say it would be absolutely impossible to raise it in that way?—Absolutely impossible.

1049. Do you mean in the Shannon or in the Seine?—In the Shannon.

1050. I thought you said it was impossible to do it in the Seine?—I will explain how these valves are workable in the Seine. Here is a drawing and a section of one of them in the Seine. The drawing is an enlarged drawing of all the details of these sluices, published in the "*Annales des Ponts et Chaussées de France,*" in which all the particulars are given, and all the experiments related. A large portion of this volume consists of explanations of the drawings of this proposed weir. I will explain to you how it works; and I might refer you to the account, which is in French, and which I have had translated for the purpose of reading it; it is by an engineer named Cambuzat. I will read to you what he states; but, perhaps, I had better explain the drawing a little first. It does not show the whole detail; but at Conflans, on the Seine, the arrangement consists of two sets of sluices, or, as Mr. Lynam called them, sluice valves, one for the purpose of allowing the boats to pass, and the other for the purpose of discharging the water simply, and removing it out of the way when the floods come. They are raised vertically, or nearly vertically, and weighted by balance weights, so as to make them retain their proper position. They cannot be worked until there is something like five feet of pressure upon them, from four to five feet in the difference of level betwixt the water above and the water below; then they topple over.

1051. Mr. *Ormsby Gore.*] Of themselves?—Of themselves; and they cannot be raised again until the water above, and the water below, is as nearly as possible upon the same level. If there is a difference of level of four or five inches, they cannot be raised. Therefore, you will see the essential conditions for working them are, first of all, that there shall be a head of water sufficient to topple them over, and that afterwards the flow of water, above and below, shall be so nearly the same level that they can be raised again. Neither of these conditions can be attained at the foot of Lough Derg; therefore, it would be impossible for this arrangement to work

1052. Mr. *Gregory.*] I suppose if the water strikes about here (*pointing on the plan*), that would not have the effect of toppling it over?—In

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— In that case it must rise to two or three inches higher before toppling over. The weights are so balanced by adjustments, which are not shown here, that the water must be four or five inches higher before it will topple over. When it topples over, it remains, and cannot be raised, because the moment you try to raise it the current overpowers you. At Lough Derg it would come through at something like ten feet in a second, or seven miles an hour. The force is so great that no machinery could raise it up. They have no machinery in France for that purpose; but they have a considerable amount of machinery, in fact, a very complex machinery, consisting of slides and pulleys, and various other things, by which, when the water is down, they get the sluices up again. I was just going to try to explain that; but observe you must first of all get four or five feet difference of level in Lough Derg in order to work them. But Lough Derg could not be permitted to discharge that quantity of water; it would create too great a flood. I calculated the quantity of water, if these things were once open, and they would make a flood of 1,200,000 cubic feet of water per minute, which was the full quantity that flowed down in 1861, and did all the mischief. Therefore you would create a flood by means of these sluices to the very amount you are trying to remedy the evil effects of; and you would have to wait till Lough Derg ran down to the bottom, and the water was the same level above as below the sluice before you could get them up again. Then you could do, as Mr. Lynam did, put a hook to it, because it would be merely moving a piece of timber in level water. Or when it gets to 2½ inches only, the thing is so balanced that it will right itself by means of the balance weights that are adjusted there. But I may as well now read to you an extract, which is a translation of what lies before you. This is an extract from the Register of the Engineer in Chief of the Nivronais Canal on the River Sone, M. Cambuzat:—"On the 14th of September 1860, I went to see the operation of the moveable weirs (*barrage à hausse*) invented and constructed by the Engineer in Chief, Chanoine, at Conflans, on the River Seine, near the little village, Romilly Halring. Arrived at seven o'clock in the morning, the 14th of September, at the weir of Conflans; I left the place at 10 o'clock, and during these three hours I have seen with great interest the operation of the weir, which has a navigable passage formed by 28 moveable lifts and an overfall weir raised by 20 self-acting lifts. On my arriving, the weir was completely open; the lifts at the passage for navigation, and those of the overflow weir, resting upon the uplifted tressles or bridges were overturned horizontally. The sill of the passage is 0·5 metre under low-water line, and the crown of the weir 0·5 metre above low-water line;" that is, the sill is half a metre below that access, and half a metre above the low-water line. "The water of the Seine was pretty light at the time, 1·07 metre above low-water line, above the weirs, and 1·00 metre below the weirs." That was a difference of about three or five inches; that is to say, the water was at nearly the same level. It was at that time 1·07 above that sill, above the weir, and 1 metre below, so that there is a difference of only ·07, which is about three or four inches." "The operation of raising the 28 lifts in the navigation weir was accomplished by two men and an assistant on board a boat in 45 minutes; the assistant has not always been working; he was there because of the condition of the river. That operation is not attended by any danger to the men. The lock keeper required 3½ minutes to prepare the lifts of the overflow weir." All the working parts are below the level of the river; they would be all in the mud and sediment brought down: they would frequently stick, and do stick there; and it is only by being kept constantly clean by constant work, that they are able to work them at all. If they were neglected for a week or 10 days, they would not be able to move them. The Committee will see on the plan the bolts and gearing crab and other things required to work the sluices; there are hooks which I suppose Mr. Lynam used for the purpose of getting hold of and detaching the crab arrangements; consequently they are drawn up against only two or three inches of head of water; if it were three or four feet, which would be the case in a river like we have at the outlet of Lough Derg, no power on earth commensurate with what is constructed here could raise them. "The top of these lifts is 1·8 metre" (that is as nearly as possible six feet) "above low water, or 2·3 metre" (that is 7 ft. 8 in.) "above the sill of the pass. The balance lifts of the overflow weir fall down of their own account when the water rises 0·1 metre above their crest. When the water above the weir rises" (that is, when the water gets to four inches above the top of the sluice) "to 1·9 metre" (that is 6 feet 4 inches) "and below the weir has fallen to 0·45 metre" (that is a difference betwixt the water above and the water below of 4 feet 10 inches, nearly 5 feet in English measure), "the lifts of the overflow-weir commence balancing; during 40 minutes they overturn themselves more and more." They do not flow over immediately, because by reason of that axle being a little different from the axle of the lift itself, they rise a little, but the balance is destroyed, and so they oscillate for a little time, and for 40 minutes they are oscillating in that manner. "They overturn themselves more and more; at this time it was 10 minutes to 10 o'clock" (this is the observation of M. Cambuzat). "The water was 1·88 metre above, and 0·9 metre below the weir" (that was a difference of 39 inches). "Afterwards, the lifts of the navigable pass of the river were lowered; this operation was complete in 1 minute 37 seconds. After the discharge, the water was 1·45 metre above and 1·32 metre below the weir; at this moment the lifts of the overflow weir have righted themselves." That is to say, there were 4½ inches of difference, and when there was no more than that the balance of this lower part was sufficient to bring it down against the 4 or 5½ inches of difference of level. "The second agent, M. Lambert, has given me long and interesting accounts." Then there are further experiments referred to; there are various other letters in this book, and there is a very full account of the experiments which have been made; from those it appears, "that the raising of the self-acting balance lifts from the overturned into the original upright position, can only be accomplished when the water below and above the weir is nearly of the same level; for instance, at a trial on the 22nd May 1861" (that is not the same trial I have been reading about, but another trial),

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"before raising the lifts the water of the Seine was above the weir 0·80 metre; below the weir 0·73 metre; or difference of level 2¾ inches English." Then it could be raised. "At a trial of the weir on the 25th of May, the water was raised to 1·88 above the weir; below it was 0·25 metre; but the balance lifts not acting on account of insufficient height of water;" that is to say, that although there was a difference at that time of 5 feet 4 inches, which was more than the previous experiment that was made a year before, when they would not tumble over, and "M. Thollière pushed them over with a pole; then the water having fallen to 1·60 metre above the weir, the boat, with two men, and with the mechanical arrangements, set to work to try to raise one of the lifts, but they were not capable of doing so, on account of the current and rapid flow of the water." In a letter of the 7th of June, signed by M. Thollière, who witnessed the operation of the Conflans weir, he says, "But I would like to see if one of those lifts could be raised in spite of the pressure of the strong current, and whether working a lift under those conditions would not be, with all mechanical arrangements to both the lift and its mechanical parts, a too severe trial." The fact is, that they are intended for a totally different state of things, for a river which may rise and fall a few feet without overflowing its banks, and where the declivity ordinarily is not very much, and where they can afford to pound it up for a short time, and let these things topple over; and when they have toppled over the water will assume as nearly as possible, above and below, the same level, and then they can be raised. Those are conditions that cannot be acquired in any place that I know of on the River Shannon. It so happens that my first acquaintance with the River Shannon was some time in the winter of the year 1842 or 1843, and it arose from my having suggested to the Board of Works, to the late Sir Harry Jones, whom I knew, self-acting sluices for the works that were then being carried out on the Shannon, in the Jamestown and Drumsna districts. I have here drawings made in 1842, which I say, with all deference, are much better than the sluices which have been proposed before you. Here is a description of it, dated 23rd June 1842. On the right hand side are sections of the weir in various positions. But I may state that what I then suggested arose from an old book, "Gregory's Mechanics for Practical Men," which is as old as my professional life, and older, in which the first idea of a self-acting weir to do the work which is recommended to be done in the present case is attributed to Mr. Farey. There you have a self-acting sluice adapted to a mill-race, or something of that sort, on a small scale, and there you have a float, which, as the water rises and falls, opens and depresses the sluice. The objection to that was that you had the float on the top, which might be injured by any timber that came down. I set to work to see if I could improve on that invention, and I introduced the arrangement you have before you. It consists of two doors, one above another, so balanced that when the water is at the ordinary height they are vertical and closed; as the water rises the pressure upon the upper half of the upper door and the lower half of the lower door is such that it begins to open, and as long as the water is of sufficient height, one keeps the other open, and the water rushes through at the bottom, carrying away any material that may have accumulated. It runs through at the bottom, midway, and over the top, and eventually, if an arrangement is made for the purpose, it may take a perfectly horizontal position, and allow anything to float over or pass freely through. It effectually removes obstruction, as you see by the section. I made a model of it, which worked perfectly. The sluice is perfectly self-acting, because, as soon as the water falls, it will come back again to its vertical position, and it requires no manual labour and no machinery. The whole of the floats are so adjusted as to make it entirely self-acting, and it cannot go wrong; but I never ventured to introduce it on a large scale.

1053. Colonel *Vandeleur.*] Where is this sluice used?—It is not used at all, because although it is 25 years since its invention, I never ventured to use it, because I saw that the weeds catching at the angles there, might be very likely to prevent its closing, and although it is an ingenious contrivance, it is one of those things that would not answer on a large scale.

1054. Those quadrants are the worst part of it?—That might be altered.

1055. *Chairman.*] By a very strong pivot?—There would be no difficulty about the mechanical arrangements; but although it would be applicable to a small mill race, it would not answer on a large scale. I want something that cannot go wrong, something that will be entirely under control, and not likely to get out of order.

1056. Colonel *Vandeleur.*] There is a tremendous leverage there?—The mechanical arrangements are not difficult; but it is not in cases where you have to deal with 1,200,000 feet of water a minute, that I should venture to introduce anything of this kind. There is another self-acting weir, which is a very much better thing than this, and certainly better than Mr. Lynam's, because Mr. Lynam's would not work; it is absolutely impossible that it could work. I allude to Mr. Forsyth's modification of what is called in America the bear-trap sluice, a very ingenious arrangement by which the water depresses the top of the weir, and rises again as the water falls. I believe Mr. Forsyth's design for a modification of that arrangement is probably the best self-acting weir which could be introduced; but I would not recommend the introduction of any self-acting weir in a river like the Shannon, because you want there an arrangement by which you will be certain to be able always to control the water.

1057. There is a self-acting arrangement at Galway, at the outlet of Lough Corrib?—I have seen the arrangement adopted there in many places. It is a falling-board; but the difficulty is how to get it back again. I know many places in which falling boards are introduced, but they are places where you have not to maintain navigations, or if you have to maintain them, the top of the sill over which these things work, and on which they fall, is the height of the navigation; and if you were to introduce these contrivances you would have to keep the navigation on a line with the top of the sill. There are other self-acting arrangements somewhat complicated, but very pretty, and constructed on very scientific principles, which the late Mr. Thom introduced at Shaw's waterworks

works near Greenock and various other places, where they rise and fall by the action of the water; but none of those are in my opinion desirable introductions.

1058. Then there are your own proposed sluices?—Perhaps you would like to have the drawings of them before you, before I speak of them. I may say that in designing those sluices (it is one of those details, which when the work comes to be executed, requires consideration), I merely designed that which was simple in itself, and which was certain to answer. This sluice is self-acting too, but on a different principle.

1059. Mr. *Sclater-Booth.*] But if we were to admit for a moment that Mr. Lynam's sluices as designed would be as good as yours, to say no more; assuming that, there would still remain the difference of principle between you, as to the cost of the works as a whole?—Yes, his sluices, my sluices, (as they may be called) or any other sluices would have the effect of lowering the water at the particular place at which they were constructed, lowering it either to its summer level, lower than its summer level, or near its summer level: now, open spaces, if large enough, would produce the same effect, and that effect, as I explained by reading an extract from my second report, would die away if nothing more were done; I have just worked out the whole cost which the sluices, foundations, and everything else, came to in my own estimates. They come to 56,000 *l.* out of the round sum of 300,000 *l.*; still, if you deduct that 56,000 *l.*, there is as large a sum remaining for the rest of the work as Mr. Lynam's whole estimate; and Mr. Lynam has not given us, as he was clearly required to do under the Minutes of the Treasury, the estimates which would enable us to arrive at the cost.

1060. There seems to be an assumption that the operation of the weirs is to destroy the natural fall of the river; what do you say as to that?—The existing weirs?

1061. Yes?—That is a fallacy, a mistake; for instance, the weir at Athlone does not destroy the fall of the river a bit, not an inch of it; it is there for the purpose of maintaining Lough Ree at a prescribed level. I heard Mr. Lynam say the other day, that he drew this comparison (I do not know how he arrived at the conclusion) that out of 44 feet, I think he said, 21 feet were destroyed; I have the memorandum which I took at the time. He said that out of a fall of 41 feet, or 8-inches per mile, which is the natural fall (it is very unevenly distributed, though) 16 feet only were effectual for carrying floods, the remaining 24 feet being absorbed by the Shannon works; I heard him also say that the difference betwixt his sluices and mine were, that his would enable him to take advantage of the natural fall, whereas mine would not.

1062. Mr. *Ormsby Gore.*] That applies to future works?—That applies to future works, but taking the existing works, I will show you, by explaining how the thing operates at Athlone, that it is a fallacy, and that it is not so. The weir at Athlone holds the water up some seven feet, and in ordinary summer weather, if I remember the figures aright, the difference in the level below the weir, and above the weir will be something more than six feet. There is only something like nine inches of fall betwixt the water at the foot of the Athlone weir, and the water at the Victoria Lock at Meelick, which is a distance of some 26 or 27 miles. The river in that state requires no more than the eight or nine inches, or the nine or ten inches, or whatever it may be, to carry its own volume; and if you had not a weir at Athlone, Lough Ree would come down to that level, and would be 6 or 7 feet lower than it now is. The whole of that fall, which is latent and useless fall in the ordinary state of the river, is absorbed by the declivity of the surface of the water in flood; and more than that, because the water rises at Athlone so high as to overtop the weir, so that there is not a destruction of a single inch of fall there. The whole of that declivity, although seven feet, and used for locking purposes in low water, is used for conveying the flood when there is a flood. And again at Meelick, the water only rises in a big flood like that upon which Mr. Lynam based his calculations, 2 ft. 10 in. above the crest of the weir, whereas the rise of the lock is seven or eight feet; therefore, but 2 ft. 10 in. are destroyed under these circumstances by the weir; the rest is destroyed by the declivity required to carry the water. If you want to pass on water, you cannot pass it except by declivity; and the single question is (it resolves itself into a very few elements, although it is a very difficult problem), is to decide what you have to do; first you will have to determine the quantity of water you have to pass; then you have to see the fall within which, from point to point, it has to pass; and according to the fall, you can give a certain velocity, because the velocity is due to the declivity, but you must make a channel large enough to exactly correspond with the fall you have in order to carry off the quantity of water you have to deal with without damaging the land; and there arises the expense of the undertaking. You must enlarge your channel to such an extent that if you have no more than four feet of fall to deal with, you must discharge the whole quantity of water without allowing it to rise more than four feet in 20 or 40 miles, or whatever the distance may be.

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1063. But to put the case as strongly as possible. Supposing the navigation to be given up, and the whole of these weirs destroyed, there would be no great diminution in the expense of drainage?—Very little indeed. The whole navigation would be destroyed, and the expense of drainage would be nearly as much as if the whole navigation were retained.

1064. So that in your opinion any expenditure failing to give some effectual relief to the whole basin, would be expenditure wasted?—That is my opinion; I should have been very glad if I could have come to such a conclusion as would have enabled the work to be carried out; but I feel that anything short of complete relief would be a disappointment, because if the relief, as Mr. Bourne, of Carrick-on-Shannon, has put it, be such as would generally drain the land, except on great floods, they would come and do the mischief; you must have the land so entirely relieved that there would be no chance of floods recurring; at any rate, more than once in 20 or 30 years, during the periods when the crops are on the ground.

1065. Although, perhaps, it is no part of your province to give an opinion as to the value of the lands

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lands to be recovered, are you aware that 90,000 *l.* represents, as far as we know, the sum that might be contributed by the owners of lands upon the principles on which such contributions are usually made for such purposes?—I have heard that: the Treasury sent me the statement of the valuation, which amounted, if I remember the figures rightly, to something more than 6,000 *l.* a-year, as the gross annual improvement which would be effected by the drainage.

1066. Speaking generally, in your opinion, works at a cost of 300,000 *l.* must be carried into effect, in order to produce an improvement for which 90,000 *l.* only could be recovered from the owners of the land?—Yes; if you treat it as a whole, that would be so; and I am quite sure that 140,000 *l.* or 200,000 *l.* spent upon the whole river, in the hope of doing any good, would be just so much money wasted.

1067. On the other side, would you say that the Board of Works, or the Government, as being owners of the navigation, might be called upon fairly to contribute such sums as would concurrently with improving the drainage, be direct improvements of the navigation?—Yes, to some extent, that certainly is so, and I think you will find that statement in my second report, on page 4: "With respect to Meelick, where some of the most important works have to be constructed, and where the greatest extent of flooded land will be relieved, I may make a few observations. If the old channels were re-opened as now proposed, and sluices introduced, very considerable relief to the reach immediately above, would be afforded, relief which would extend in a diminishing degree to beyond Shannon Bridge, even if no other works were constructed; but the velocity of the stream at Banagher, at Derryholmes, and at Bishop's Islands, would probably be such that the navigation could not be carried on in times of flood without difficulty; and the beneficial effect of the sluices would nearly disappear before we reached Athlone." And I think it is important to read the next paragraph: "By the proposed sluices at Meelick, and at the upper ends of the re-opened channels, the surface of the river at Banagher, in such a flood as that of August 1861, would be reduced in level about 2 ft. 6 in., or from that to 3 feet. In order to maintain the same reduction up the river, it is absolutely necessary to enlarge the channel at Derryholmes and Bishop's Island. Even when these are executed, the water at Shannon Bridge cannot be reduced in such a flood to more than the corresponding amount at Banagher, namely, 2 feet 6 inches or 3 feet, and this difference will diminish as you ascend to Athlone. The callows immediately below Athlone cannot therefore be secured from inundation on the occasion of a flood of this volume, except by such judicious management of the sluices at Athlone as will be anticipated by rapidly discharging the water at the commencement of heavy rains, and so creating impounding space for moderating the effect afterwards." That shows the necessity of having sluices which are not self-acting in the sense that has been proposed to you, but sluices which you can command, and which you can open and shut as occasion may require.

1068. But that is hardly upon the point I was asking about?—I know what your question was, and I was coming to the answer to it. I was going to refer to page 6, but it is rather necessary that you should know these facts beforehand. "By your Lordship's further instructions, under date of 14th September 1866, I am requested to consider whether in the event that all the works which may be desired should prove too costly to be undertaken, some improvements could be effected at a reasonable expense, without carrying out the whole. With reference to this instruction it will be perceived, from an examination of the table just alluded to (Appendix A.), that considerable differences exist in the cost per acre of the works proposed. This arises from the different circumstances of the various reaches of the river. In all cases where it is necessary to widen or deepen the river the cost of the alterations required, if measured by the relief to be afforded in the same reach, will be greater than the value of the land to be benefited; but that where the land flooded lies upon the margin of lakes, or upon reaches on the same level, and where the relief to be afforded consists of little more than the introduction of sluices in the weirs at the outlets of those lakes, the cost of the works will not be greater than may be reasonably entertained. Between Meelick and Athlone, although the works involve a large cost per acre, the navigation will in several places be so improved, and a so much better outlet will be provided for the waters of the River Suck, that some contribution from the parties interested in these improvements might be reasonably looked for; and in this way the cost of the landowner may perhaps be reduced to a point which will warrant the necessary expenditure." Then I think I must also read the next paragraph, as a caution against carrying out such partial improvements:—"Thus, although throughout the whole of the river one part is very dependent upon another, there may be certain places at which partial improvements may be effected. The only places, however, in which such partial works could be carried out with anything approaching to safety, having regard to the effect upon the landowners below, are Lough Allen, Jamestown, Athlone, and Killaloe. At Lough Allen much benefit would accrue, and no injury comparatively would be done by shutting up the floods, and discharging them gradually on the cessation of rain. At the three other places the sluice-keeper might be permitted to discharge water by means of the sluices, until the river below attained a level consistent with the preservation of the adjoining land from flooding; then he should gradually close the sluices as the rain increased, till, if it were necessary to keep down the water below to the prescribed level, the whole of them should be closed; after which the water passing over the weirs (which would remain of the same discharging power as now) would leave the condition of things as heretofore." Now if you will refer to the Appendix (A.), you will find that if you take from Meelick to Killaloe, the estimated cost of the works amounts to 5 *l.* 12 *s.* 5 *d.* per acre upon the land, which would be relieved from flood or benefited by the works; but you must add the cost from Killaloe to the World's End, because it could not relieve the land above Killaloe from flooding, without creating damage to the lands below, unless you prepared for carrying off the floods, and therefore you have to add the estimate of 33,813 *l.* for the works between Meelick and Killaloe, to the estimate of 24,847 *l.* for the works betwixt Killaloe and the World's

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End, making a total of 58,660 *l.* Then those works would relieve 7,211 acres of ground, and if you divide the cost by that acreage, it would be about 8 *l.* an acre, taking those two reaches together. It would be subject of course to some addition for carrying out the works, superintendence, engineering, and other contingent outlay; but the mere cost of the works would be about 8 *l.* per acre, for the relief of about 7,200 acres of land.

1069. Colonel *Vandeleur.*] That is from Meelick to Killaloe?—From Meelick to World's End.

1070. How is it from Athlone to Meelick?—This is from Meelick to the World's End.

1071. I mean from Meelick to the World's End?—Then, I must observe, that those works are upon a scale sufficient to carry all the water which would be brought down by the works above if wholly carried out; and if they were once and for ever abandoned the works might be reduced not very much but to somewhat smaller works.

1072. Would you propose to execute the works from Athlone to Meelick, or the works at Meelick alone?—The Meelick works are the most important; the works at Meelick come in the next division above; the cost of those works are not included in the two sums I have now given you.

1073. Mr. *Sclater-Booth.*] But what I wanted to come to is this: could you put a money value upon the contribution which the Board of Works or the Commissioners might be expected to make with regard to their interests as owners of the navigation?—It would be difficult to do that.

1074. I understand you to say that at two or three places on the river the navigation is capable of improvement?—Yes, no doubt.

1075. And if it were worth while for the Commissioners, in the interest of the navigation, to make those improvements, any sums of money which they might fairly be expected to pay for that purpose would be so far in diminution of your total estimate of 300,000 *l.*?—That would be so.

1076. Can you, in round numbers, and without committing yourself at all, give us an idea of the sum of money that would be requisite?—That is more a commercial than an engineering question, because if the trade on the river was very great, so that any material impediment to the navigation would be of considerable importance, it would be worth a great deal of money to get rid of it; but if the trade is very small it is worth consideration whether the cost to relieve yourself from the difficulties under which you now labour would be compensated for by the result, or rather whether the result would be worth the expenditure.

1077. Mr. *Bonham-Carter.*] It is the cost of so many horses and men, for so many days, and so many ships, I suppose, now?—Hardly that; it is the cost of so many days' total interruption to the navigation of the river. There are times in floods when the ordinary steamers which navigated the river when I was there cannot go up the narrow part of the river above Meelick; the traffic there is absolutely suspended, and they are obliged in those times to use an old canal called the Clunaheenogue Canal from Hamilton Lock towards Banagher; only small boats can go there; in other places there are rapids; there is a rapid at Bishop's Island, and one at Derryholmes, as I have said, which, if there were much increase, would be in the same condition, so that a steamer could not go up; but it is a question after all, whether the cost of the improvements would be greater or less than the advantage to the trade.

1078. Colonel *Vandeleur.*] That would be an improvement to the navigation?—An improvement to the navigation.

1079. I will also refer you to Killaloe?—Yes, but the improvement to the navigation at Killaloe may be effected by an outlay of 1,000 *l.*

1080. Mr. *Ormsby Gore.*] A thousand pounds?—The improvement of the navigation at Killaloe.

1081. Mr. *Sclater-Booth.*] So far as the interests of the navigation are concerned, would the sums of money which the Commissioners of the Shannon might be justified in expending upon the improvements of the navigation, bear anything like a proportion of the whole sum of 300,000 *l.* which you considered to be requisite to drain the Shannon valley?—I think not; if it be measured by the advantage they would gain upon a commercial estimate, I do not think the advantage would warrant the expenditure of a large sum of money; I believe that is the only way in which I could put it.

1082. I want to ask you one question as to a point which was discussed the last time we were assembled, as to the level of the water at Killaloe. You have stated, I think, in your report that the levels of the Shannon are lower as a whole than they were before the works were constructed?—That is so, from the evidence that is before me.

1083. It has been specially stated with regard to Killaloe, that the level there is considerably higher than the Parliamentary level, and that great damage is done by that means, and a great grievance inflicted on the proprietors of a certain part of the district; what is your opinion as to the real state of the case at Killaloe?—I do not know that I can give a positive answer to that, because it is a question of fact: a question of level between what was originally intended and what was actually constructed. and I was called upon to investigate, not whether everything had been done according to the Parliamentary plans, but whether the effect of what had been done was injurious or otherwise, and I am afraid I cannot give any positive answer to the question you have put; I have been looking to see if I could, because I saw it was alluded to the other day, but it does not seem that I have before me the means of doing so.

1084. Mr. *Gregory.*] I suppose you could give an answer as to how far the deviation from the original Parliamentary plans has affected the drainage at Killaloe?—Yes, I have given that answer, assuming at all events that there is deviation, which I cannot speak to.

1085. Mr. *Sclater-Booth.*] But does it follow as a matter of course that, because the level of the water at Killaloe is what it is stated to be, therefore there has been a deviation from the Parliamentary plans. Is it not possible that the alteration may be in the lowering of the sill of the lock?—Yes; but I believe that the old lock at Killaloe is as it was, and that the sill has not been altered. If it has not been altered, it is a mere question of level between what was intended and what really exists; but I think Mr. Gregory's question was assuming that to be so

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(the raising of the top of the weir I suppose is the point); whether that has had any injurious effect upon the lands above, my opinion is that it has not. The water, in its ordinary state, when the river is low, is low enough to free all the lands of water, and when the river is in flood, the fall in the surface of course ceases the moment you get to Lough Derg, because it is so large an expanse of water; it may be taken to be a dead level nearly all over the surface of the Lough; and judging from the registered heights of water which have been kept, and correcting them as I find it necessary, in consequence of the alterations made there, the height of water in flood appears to be less now than it was before; that is the only way I have of deciding the question.

1086. Mr. *Gregory.*] Has not the summer level been kept up by the Commissioners two or three feet above what was originally contemplated?—No; I think the only difference is a question of nine inches.

1087. Have you not been up the Shannon yourself in the summer at a time when it has been more than two or three feet above the height originally contemplated?—No, never. In summer, the water runs down to only a few inches over the top of the weir; and if the sill of the old Killaloe Lock is exactly as it was, I think the question is, what height the weir is now. I know, because I have a section of the old weir, and by reference to that I could tell you exactly what the state is; but the weir varies, in level; it is higher at one part than another. I think the average height must be something like six feet six or six feet nine inches above the old sill; that can be the only difference.

1088. You think a reduction of nine inches would not affect the drainage?—No, I believe it does not affect it; that is to say, when the water is at low summer height, a few inches higher than the weir, running over the weir, there is no prejudicial effect on the land adjoining Lough Derg. I went up for the purpose of ascertaining all that, and getting all the information I could; and I made memoranda as I went up the river on more than one occasion as to the height the land stood above the water, but if I recollect rightly, if the water was kept down at Portumna to something like one foot ten inches above the level of the top of the weir at Killaloe, no injury whatever would be sustained.

1089. Mr. *Ormsby Gore.*] Does not that weir regulate the level on the whole of that reach of the river? — It regulates the whole level of Lough Derg, and to the extent to which Lough Derg obstructs the flow of the water which comes down from Meelick, it regulates that also.

1090. Then of course it must throw the water up on the land to an additional height of nine inches?—If it is raised nine inches higher than it ought to be; I do not know what it ought to be; but if it is raised nine inches higher than what is assumed to be the level at which it ought to stand, of course the water stands nine inches higher, not upon the lands but upon the Lough.

1091. But would it not go over the land?—To a very small extent indeed, if any, but the land is free of water when it is not standing more than 1 foot 10 inches higher than the weir at Killaloe. I believe I am right in saying that, but I have had the evidence before me upon it, because it was upon that I determined upon the arrangements required. The point I wanted to ascertain was, what height the water might be permitted to stand above the top of the weir at Killaloe, without injury to the adjoining lands. My impression is, it would be 1 foot 10 inches. Here is my own observation made upon the spot on the 16th of August 1862. The gauge at Portumna stood seven feet nine over datum. The highest this season was on the 31st of January, when it stood ten feet nine. The water was off the callows on the 24th of February. In dry weather the callows are clear, when the gauge indicates only eight feet six inches; that is if seven feet were the height of the weir, it would be 18 inches, not 20 inches difference. In wet weather it would be eight feet five, and in dry weather eight feet six. The callows are clear when the water is not more than 18 or 20 inches above the top of the weir.

1092. Mr. *Ormsby Gore.*] You are aware that the navigation above Athlone is of little or no value to the public?—The Royal Canal comes into the River Shannon above Athlone; above Tarmonbarry.

1093. But, as matters exist now, the traffic there is very small indeed?—It may be; it is small, I know.

1094. Supposing it to be merely nominal, did you ever take into consideration what would be the effect of cutting down the weirs above Athlone, so as to make the navigation one foot less draught of water than exists now?—The effect would be merely to reduce the navigation depth so much. It would make no difference in the expense to be incurred in the draining of the land, if that is what you mean.

1095. Would it not have a beneficial effect upon the draining of the land?—Yes, it would have a beneficial effect certainly, inasmuch as the water would be a foot lower from the surface of the land.

1096. In case of heavy rainfalls the flood would not rise?—It would have no effect whatever in the case of a heavy flood, because the channel is so small; it would fill the channel, and go over the land directly.

1097. Mr. *Bonham-Carter.*] How far up would the difference of a foot have any effect?—I passed up in a boat drawing 5 feet 9 inches and a half of water, and we touched the shallows all the way between Tarmonbarry and Jamestown. The boat dragged every now and then; 6 feet was the nominal depth.

1098. The river was in a low state?—Yes, it was then 6 feet 2, or 6 feet 3 inches, or something like that. There was the suck of the boat, but drawing 5 feet 9 inches and a half, we touched every shallow between Tarmonbarry and Jamestown.

1099. Then the beneficial effect of the foot about which Mr. Ormsby Gore has inquired, would not affect the whole of the way up the stream to the next weir?—In dry weather, it would operate nearly the whole way, because the channels are large enough, with a very small declivity per mile, to carry away the dry weather volume; but they are not large enough to carry away a flood of any amount whatever, and the moment the river was swollen to anything like what might be called a flood, it would flow over the adjoining land.

1100. Mr. *Ormsby Gore.*] Mr. Lynam has stated that, according to your plan of sluices, the moveable part occupies a third of the sectional

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area of the water, so that when it is to be opened as far as the machinery will admit, there will still be a third of the sectional area of the water, so that when it is opened as far as the machinery will admit, there will still be four-tenths of the sectional area of the water shut?—I do not know the exact proportion, but there will be a large proportion of it, no doubt.

1101. That is unavoidable?—All that is necessary is a sufficient space for the water to pass through to keep down the head to a given point. If you had it all removed, you would have such a flood as he would create running at the rate of 1,200,000 feet per minute. What you want is such a space as would be sufficient to reduce the level above the weir to any fixed height that it would be desirable to reduce it to.

1102. "The surface of the water at the upper side of the sluices is to be two feet over the upper side of the aperture, when the aperture is open to its full extent"?—That is simply a question of economy in the arrangement of the work. If it were to be as high below as above, then the river below would not carry the water away, and you would have to adjust it, and it requires a very nice calculation. At Killaloe, I keep the water down by means of these sluices to such a level as will prevent any inundation on the whole of the reach above: there is no occasion to keep it under that.

1103. Have similar sluices been erected anywhere?—Yes, I have here drawings of sluices which have been at work on the River Etherow, below the Manchester waterworks, for the last 14 years.

1104. Would not floating timber be caught by these sluices?—Not to do any mischief, because in advance of the sluices you would have a boom that would rise and fall with the water, to stop anything of that kind.

1105. Above the level of the water?—Yes, it is above the level.

1106. That boom must be regulated in some way?—It would rise and fall with the water. It would be swung by chains. These (*pointing on the plan*) are large openings. Everything else would go through, and the water would flow over in the same way.

1107. Are they self-acting?—They are self-acting to this extent: they are worked by a turbine wheel, and if the man in charge neglected his duty when the water rose to a certain height, it would set the turbine wheel in motion, which would raise the sluices. Of course an arrangement might be made by which it could shut itself when it got quite open.

1108. It would be as much self-acting in lowering as in rising?—No; because the water requires to rise to a certain height, before it would fall into a pipe to feed the turbine wheel, and if the water is below that height the valve has to be opened.

1109. The turbine wheel would be very destructive if salmon were attempting to ascend the river?—If they got into the turbine wheel, I would not answer for what they would be like when they got out, but it only occupies a part of the river.

1110 The main current would be through the turbine wheel?—No, very little.

1111. In case of a flood?—In case of a flood the turbine wheel would never move at all after the sluices were open; the water would go through the sluices or over the weir. Perhaps you will allow me to complete my answer. You were asking me if such sluices had ever been constructed. I have before me the contract drawing of sluices which were constructed in exactly the same way on the River Etherow, below the Manchester waterworks. This (*producing it*) is a plan of the river. It is a cast-iron weir, and has a self-acting arrangement, by which the water is held back a certain number of hours during the night.

1112. Were these sluices erected under your recommendation?—Yes, and these are not the only ones. They have been erected in other places on the same river.

1113. Colonel *Vandeleur.*] What is the size of the river you mention?—It is not so large as the Shannon, but still it is a very considerable river in floods.

1114. And so heavy floods come down it?—You can see by the size of the sluices that they are not very small things; the scale is a quarter of an inch to a foot.

1115. All these work together?—Either together or separately.

1116. You can throw any one of them out of gear?—Yes; and so you can in the arrangement upon the Shannon.

1117. I mean upon the Shannon; the lock-keeper could throw any one of these out of gear?—Yes, he could.

1118. Or, if any one got out of order, it could be repaired?—I will show you how that is arranged. If any one got out of order, every arrangement is made for repairing, because, otherwise, that would be a serious objection. These little recesses are places for stop planks; if any one gets out of order you have to drop stop planks into the recesses, and you can get down to repair it. Those which have been erected at the Manchester waterworks are much more liable to damage, because there is timber above, and villages and houses and towns; but so far as I know, not a shilling's worth of damage has been done to them.

1119. How long have they been in use?—Fourteen years.

1120. What size are those proposed to be for the Shannon?—I think each of these openings is 6 feet by 4 feet, if I remember rightly.

1121. They are put upon the lower sill of the weir?—Yes; the discharge through them is due to the difference in the level above and below.

1122. The whole of this sill is ordinarily covered by water?—Yes.

1123. The works are all under water?—All the gearing is above water.

1124. But all these sluices are?—The sluices are below water, but there is nothing that can go wrong below water; all the gearing of the French sluices is below water on the bed of the river.

1125. In a permanent work, I should be afraid of the endless screws and ratchets?—I have had the same arrangement at work for 18 years at the Manchester waterworks, and they are just as good to-day as they were when first put in. If they do get out of order they are easily repaired; it is a very simple mechanical arrangement; as simple as a pair of boots.

1126. The turbine wheel is in the centre?—The turbine wheel is in the middle of four compartments, each having two sluices, and that turbine wheel commands eight sluices; it may act upon any one, or altogether.

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1127. If anything happens to the first portion of the shaft, you must close the two sluices?—If anything happens to the shaft; if it broke here (*pointing on the plan*), that would stop this compartment altogether.

1128. If it jammed?—Nothing can jam; it is all above; if the shaft is made big enough and strong enough in the first instance, nothing can go wrong with it.

1129. That would not interfere with the other side?—Not at all; they must be very bad mechanical constructors if they could not arrange that.

1130. You make things to last for ever?—We do make them last for ever nearly; besides, it is not a thing difficult to repair.

1131. Sir *Graham Montgomery.*] You can raise this with one motion?—That turbine wheel will work at one foot six or two feet difference of level. It must have that fall to work. We can command a requisite amount of head or fall to set the turbine wheels in motion; with that amount all the sluices can be raised; with a smaller amount one can be raised. If you have only two or three inches of head that will be sufficient to raise one of them.

1132. Colonel *Vandeleur.*] In a great permanent work of this sort, would you not prefer an ordinary fixed sluice, to be raised by ordinary mechanical means?—This is one; this is worked by a turbine wheel to save mechanical labour. In the Manchester waterworks I have had them at work nearly 20 years, and nothing has happened to them. They are the simplest possible contrivance; there is nothing to go wrong in them, and they are so simple in all their parts that they are very easily repaired. The turbine wheel is a saving of mechanical labour, because if you have to use manual labour you require a considerable number of men; here you make the water do its own work; you have a large amount of water power running to waste, and you economise that by making it drive a water wheel for the purpose of making for itself an escape in times of flood.

1133. Mr. *Agar-Ellis.*] How many men would it take to work this; a considerable number of men, would it not?—One man can look after the whole series; all he has to do is to open a valve, and so couple or uncouple these various sluices. He may open the eight all together, or one of them at a time.

1134. Mr. *Bonham-Carter.*] Did I understand you to say that, having been instructed in your examination to make a report with reference to the maintenance of the navigation in its present condition, you are nevertheless enabled to state that a lowering of the navigable channel would not in many instances have the effect of relieving the floods?—It certainly would not relieve the floods.

1135. I am quite aware that you are obliged to consider the navigation as to the present point; but, taking that part where the greatest injury occurs, between Meelick and Athlone, are you sufficiently informed to be able to state that the lowering of the navigation would not be of very material advantage to the drainage?—Not as respects the floods. Of course if you have the ordinary surface of the water one foot lower than it now is, you have drainage in dry weather to that extent; therefore, in that way, the land is very often improved; but no sooner is the River Shannon at all flooded than the channel is so much too small to convey the water that any benefit would be lost.

1136. But do I understand that your examination did not put you in a position to ascertain what would be the effect in dry weather of reducing the water level by a foot?—Well, it hardly occurred, or could hardly occur, under my instructions. It was not put to me how much the navigation could be altered or improved, but what was necessary to be done for the purpose of relieving the land from floods. I found it was necessary to enlarge the channel, and to put in sluices to the weirs, which would be tantamount to removing those weirs altogether in times of flood, or nearly so, so that, as far as the practical effect goes, the weirs in several places may be considered as non-existing in time of flood, or nearly so.

1137. I see that in your last Report you mention that the owners of land on the Shannon might be made contributaries: did you make any calculation with regard to the Suck proprietors?—The Suck proprietors are not at all interested in improvements going on in the Shannon, except just in the district below Ballinasloe. Betwixt the Shannon and Ballinasloe there is a weir, the name of which I forget at this moment, which is scarcely ever, I believe, topped by the Shannon floods, and certainly the backwater of the Shannon never reaches to the top of the weir, which occurs next above it at Ballinasloe; so that the only beneficial effect upon the River Suck would be, that if you kept down the water of the Shannon at its junction with the Suck three or four feet, which would be the result of the improvements I have suggested, it would give to that extent a better outlet

1138. And would the effect of that outlet be such as to make a very material reduction in the amount of relief to the landowners in the valley of the Suck. It would give them a better outlet; how far that outlet would facilitate or cheapen the execution of their works above, I am not prepared to say; but to the extent of 2 feet 6 inches or 3 feet, which I dare say it would be at the junction of the Suck, to that extent they would have so much more fall to work upon in the drainage of the River Suck.

1139. It was not in your instructions to calculate that?—It was not; I had to provide the works for carrying off the additional quantity of water that might be expected down the Suck, and that I did.

1140. Mr. *Ormsby Gore.*] Will you explain, Mr. Lynam, how you close those sluice valves. (Mr. *Lynam.*) I think Mr. Bateman said that when the sluice valve was open it would be scarcely possible to shut it; we will take it that the water has risen to that height that will endanger the crops, and that the valve has either opened by itself or has been opened, and that it is in a nearly horizontal position. If I recollect rightly, Mr. Bateman expressed himself to the effect that when it was open and in a nearly horizontal position, it would require powerful machinery to shut it; I should like to know if I am right in saying that. In that case, he said, it would require powerful machinery to shut it, and in another answer he said it would be scarcely possible to raise it; am I correct?—(*Witness.*) Quite correct.

1141. To shut it?—Not to open it, but to shut it.

1142. I said

1142. I said to shut it. We know very well that this flood valve being set upon the central pressure by this axle, the higher the water rises above it the easier it is to open it, and the less power is required to open it?—There is no difficulty to open it. (Mr. *Lynam.*) I believe I am perfectly right in that position.

1143. Mr. *Ormsby Gore.*] The opening is allowed; now we want to hear about the closing. (Mr. *Lynam.*) I want to show the reason, because the reason comes in the other way. The reason that happens is because the higher the water is the more pressure is brought to bear above the axle; it is an evident truth that the lower the water is the greater the pressure below the axle, and the less above. Now, I say, the higher the water is the easier it is to open the valve, and the lower it is the easier it is to shut it; that is, the water up stream from the valves. There would be the absence of pressure to keep it open, and the entire pressure would be upon the lower board. I beg to assert that the lowness of the water above contributes to the shutting and prevents the opening; that the highness of the water, that is to say the rising of the water, facilitates the opening, while the falling of the water facilitates and aids the shutting. (*Witness.*) Mr. Lynam has evidently omitted to calculate the force of velocity. If he has ever tried to cross a river running 10 feet in a second, or seven miles an hour, he will know how impossible it would be for him to attempt to keep on his legs. The water at the sluices is running through at that velocity when the valve is flat, a velocity of 10 feet per second; the moment he gets the force of the current of this velocity impinging upon the valve, according to whether it is directly upright or nearly horizontal, there is a pressure equal either to the full depth of water which would create the velocity I have mentioned or double that depth, so that he cannot get the valve up. It will be seen from the observations I read as to the experiments on the weir at Conflans, that with 4 inches of difference only they could not raise it. Now, the condition of things, say at Lough Derg, is such, that you could never get a difference so small as 4 inches, unless you discharged the whole of the water of Lough Derg, because there is a rapid below Lough Derg that would enable the water to run away so rapidly that you would always have a greater declivity betwixt the water in Lough Derg and below than 4½ inches; in fact, it would be several feet.

1144. Mr. *Ormsby Gore.*] There is no difficulty in closing the valve provided the level of the water is not above Lough Derg?—There is no difficulty if the level of the water above the weir and the level of the water below the weir are about the same.

1145. I am not speaking of the weir but of the sluice valve?—No, if you could get at it; in that position (*raising the valve of the model*) it would close with tremendous force (*illustrating*). (Mr. *Lynam.*) The velocity as a force acts in addition to the pressure of the water; does not that velocity act upon the lower part of the valve as well as upon the upper part? (*Witness.*) Not when it is horizontal. (Mr. *Lynam.*) When it is horizontal there is no pressure upon it beyond the mere striking against the plate.

1146. Mr. *Ormsby Gore.*] But the position is slightly altered then directly you begin to move the sluice?—

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1147. Mr. *Bonham-Carter.*] If it is in a horizontal position, is not the leverage on the upper part infinitely greater than the leverage on the lower?—(Mr. *Lynam.*) Double.

1148. Mr. *Agar-Ellis.*] What would be the smallest depth of water running over the valve when horizontal?—(Mr. *Lynam.*) Four-and-a-half feet. (*Witness.*) The difference in the level betwixt the water above and the water below would be several feet in ordinary circumstances.

1149. What I mean is, that the flat surface would never be out of the water?—It would never be out of the water.

1150. But how much water would there be above it?—What I contend is that having once opened the valve Mr. Lynam would never get it up again till Lough Derg had run down to a level which enabled the river below to fill itself to within about three or four inches of the level of the water of Lough Derg.

1151. Keeping Lough Derg to the height at which you wish to keep it, can you give me an answer as to the smallest depth of water there would be above the valve when you wished to close it?—In this way; this would open when you had got three or four inches of water above it. I presume it would have to stand within three or four inches, or about the level, whatever it may be, of the height of the weir. If there were three or four inches more, then that would create such a balance on the upper part that it would open it. You do not want to lower Lough Derg, if you are to maintain the navigation, and not to inundate the river below, more than the level of the top of the weir. In order to do that, you must open one or more of these valves as the flood comes. The large flood of 1861, was at the rate of 1,200,000 cubic feet of water in a minute. In order to pass that quantity of water in the area which Mr. Lynam has proposed, you must have the whole quantity of 420 feet, which is his proposal, four feet in depth, or thereabouts. You would have a difference in the Lough above, and the river below, of four feet, because the river would fill, to some extent; but there would be two or three feet of difference, under any circumstances, because there is a great rapid towards World's End; the water would run away; if it did not, it would be creating such a flood on the people below as would drown out Mr. Horace Twiss and everybody else.

1152. I do not think I made my question very clear. Supposing you had let all the water off, so that the valve was out of the water?—There would be no difficulty, whatever, then.

1153. There would be no difficulty in closing it?—None whatever.

1154. To keep Lough Derg the proper height, that could never be the case?—That could not be the case.

1155. You could not give any guess at how much water there would be above the valve, when you would wish to close it, having let off the flood water?—This answer, perhaps, will suffice, that you cannot close it unless you have very powerful machinery, indeed, which you can use against this enormous velocity; and the machinery and the material altogether would be such as would be almost too heavy to work if you had a greater difference between one and the other than four or five inches. I cannot say to an inch.

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1156. Colonel *Vandeleur*.] The flood would run off?—But Lough Derg then would be five below its level, and the navigation would be destroyed.

1157. When it stands so (*obliquely*), it takes off the flood?—When it rises three or four inches higher than that the valve falls down, and you cannot get it up again until the water either falls from above to the level of the water below, or the water rises to within about four or five inches of the level of the water above.

1158. The water must fall till it is within four or five inches of this level (*placing the valve horizontally*)?—Then Lough Derg is five feet too low.

1159. That is the intention, is it not?—If you let it do that you would have a flood for four days equal to the flood of 1861.

1160. You can regulate that according to circumstances?—No, indeed. (Mr. *Lynam.*) There are 84 of these placed across the river; any 1 or any 10, or any 20 of which can be open, and the remainder shut. (*Witness.*) None of them can be raised again.

1161. Allow me to show how the valve is raised, when the water is coming down in a very great current; suppose it to be coming at the rate of 50 miles an hour, what part of the force below, both weight and velocity, tends to prevent the shutting of the valve. What is caught by about two inches or two inches and a half of thickness of the plate which is at the end of the valve. When the valve is horizontal, there is no weight or pressure tending either to open or shut it. That is when it is in the line of the current, or rather it would be a little downwards, because there would be a slight fall, and when it is in the line of the current there is no force from the water tending either to lower the valve or to raise it. Then let any force be applied to the top or longer end of the valve, with a leverage (as the Honourable Member said), that is considerably more than the leverage on the lower part, and it is, as regards the action of the water, in a state of equilibrium; the current tends neither to shut it nor to open it, and the force sufficient merely to overcome the friction of the axle will shut it. The moment it becomes slightly raised the greater weight of water being upon the lower part shuts it. That is the way I saw it acting a week or two ago at Port de l'Anglais?—May I ask Mr. Lynam the difference of level above and below the weir upon the Seine?

1162. When any one of these valves is open, there will never be less than 4 feet 6 inches of water passing over it, which would carry all ice, and ice is a serious matter in the Shannon, and there would be 2 feet 3 inches of water under.

1163. Mr *Bonham-Carter.*] If there is never less than 4 feet 6 inches passing over it, how are you enabled to raise it?—(Mr. *Lynam.*) You will see by the drawing there is a bridge across on which a man can raise the valve with a crook.

1164. If there is 4 feet 6 inches flowing over the valve, how will you be able to apply any leverage to the top?—It can be done by a chain attached, but I object to a chain, because a chain would collect the floating matter. It can easily be done by a crook from the bridge on the top.

1165. Have you calculated the force which would be required?—I have, and I have raised one of the valves myself.

1166. With 4 feet 6 inches of water passing over it?—I think it was about four feet; I will not say to four or five inches.

1167. Mr. *Pollard-Urquhart.*] Was that on the Seine?—On the Seine.

1168. With a smart velocity?—With a tolerable velocity. They have been working in the Seine since 1855.

1169. Mr. *Agar-Ellis.*] Mr. Bateman asked the difference of level above and below the weir? —On the 9th of August experiments were made in presence of the engineers of the *Ponts et Chaussés*, Messieurs. Lagrené, Boulé, Garceau, and Baraban. The *barrage* was opened in one minute and a half, and closed in 40 minutes. (Mr. *Bateman.*) What is the difference below and above; that is the point?—The *déversoir* was opened in five minutes, and shut in two minutes. The opening and shutting were made with the greatest regularity; here is the last book on the subject.

1170. What is the difference of level?—This is a later book on the subject by about five years, than the one produced by Mr. Bateman. "We may thus raise in one hour a navigable pass of 50 metres, that is about 175 feet." *L'abattage*, that is, the opening of a pass of 50 metres, is made in four minutes. There is the book.

1171. But what is the difference in the level; time is nothing?—I have the level here, but I think I have made it plain that there is no difficulty in closing the valves. (Mr. *Bateman.*) No, you have not You have not made it plain at all.

1172. Mr. *Agar-Ellis*.] Have you got the level?—(Mr. *Lynam.*) I have it here; there were many experiments made

1173. Sir *Graham Montgomery.*] How is the crook worked?—It is worked by a man from a foot bridge across the river. The raising of the 29 *hausses* or valves lasted three quarters of an hour, and when the last of them was raised, the fall from above to below was three-tenths of a metre, which is within a small fraction of one foot. We never would have more than a foot in these cases. I think that is all I have to say.

1174. Mr. *Ormsby Gore.*] Will you tell us the principles upon which you calculate the quantities of water passing over?—It would be a mistake to suppose that I calculated the quantities of water passing over by Mr. Beardmore's tables, although I must say they are exceedingly good, when you take them with the explanation he gives in the preface. I used two methods of calculating the quantities of water, one according to the formula and tables published by John Neville, Esq., C.E., of Dundalk, a work that has been applauded and received as a class-book in the Queen's College and most other colleges in Ireland. I collated that, and compared it with the formula laid down by J. B. Francis, of America, who has made immense experiments as to the quantities of water passing over weirs, and the modes of measuring them at a place called Lowell, in America. He has published a very large book on the subject, detailing an immense number of his experiments, and he has laid down a rule for them. Now I find that Mr. Neville, Mr. Francis, of America, and Mr. Blackwell, an eminent engineer in England, who has also made experiments on the subject, all agree very nearly in their formulæ. It is upon these formulæ that I have calculated my quantities of water, and I know that I am correct. (Mr. *Bateman.*) That is exactly what I stated, that Mr. Lynam had taken

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taken a formula for calculation, which formula I was able to deduce from the figures he gave, but which I state is not a formula (nor is any formula) applicable to the circumstances of a river in flood. All those are measurements of water flowing over weirs from still water pools above, and do not represent the quantity of water that flows over the weir, where there is considerable velocity above. which adds to the velocity over the weir. (Mr. *Lynam.*) I must say that velocity was decidedly taken into account in my calculations. (Mr. *Bateman.*) It could not have been. I know what your figures come to. They come to what is the proper calculation for the discharge from a pool of still water. (Mr. *Lynam.*) If you will give me a day before an umpire, I will be happy to meet you on the subject, and pay your expenses and the umpire's expenses, too.

1175. Mr. *Gregory.*] Have you examined all the deviations from the original plans?—No, I have not. They have not formed any part of my inquiry.

1176. Do you think it will be possible to execute any portion of the drainage proposed by the landowners in sections?—Yes, I think it may be so. I have endeavoured to explain, both by the evidence I have given to-day and in my second report, that there are sections of the river in which, as it appears to me, it may be worth the while of the landowners to undertake the improvements, but with reference to all improvements, my instructions were (and I think they were wise instructions) that I should consider what would be the possible effect of improvement on the higher reaches, and the effect of discharging water more rapidly than had been the custom on the lower reaches, because one has to protect the interests of all the parties concerned.

1177. Do you think it possible to do as Mr. Lynam proposed, to try the experiment of your system, his system, and Mr. Forsyth's system of sluices?—You may as well save your money; it will be impossible for his to work.

1178. Mr. *Pollard-Urquhart.*] Have you had any opportunity of comparing the plans that were originally submitted to Parliament with the works that have been actually executed and completed?—I may say I have had the opportunity, but I have never directed my attention to those points, because they did not form part of the inquiry I had to make.

1179. Then you are unable to say for certain whether the work executed came up to the expectations, on the faith of which the proprietors allowed their lands to be made liable?—I cannot answer that question.

1180. Then the evidence given by you before the House of Lords as to the works having succeeded very well, has nothing to do with the expectations which the proprietors were induced to form upon the plans submitted to Parliament?—That I cannot say anything about. What was submitted to me was, whether the work as executed had contributed to mitigate or lessen the injury.

1181. Colonel *Vandeleur.*] You say in your Report. "The alterations by the Shannon Commissioners vary so much from their original designs, that no sound or proper conclusion as to the works required, could be made without such preliminary surveys." Therefore you must have taken that into consideration?—Yes, of course; in arranging the works that would be necessary I had the advantage of seeing all the original reports; but in execution, as is not at all uncommon, the works had not been executed entirely in accordance with the plans submitted to Parliament, therefore I could not take those designs and plans as a guide for what I had to lay out.

1182. Mr. Gregory asked you about deviation, and you have heard it stated repeatedly, that there was to be a very considerable deviation at Killaloe?—Yes.

1183. There was a great deal of land, a point there, that was not cut away, and you have yourself made a plan for cutting away a large portion of that?—Yes.

1184. Which would cost a considerable sum of money?—Yes.

1185. You have also estimated that at Derryholmes and at Bishop's Island a considerable portion of land should be cut away to widen the channel?—Yes, but most of my suggestions are in excess of anything that was ever proposed by the Shannon Commissioners.

1186. But your suggestions now go to cutting away, widening, and deepening the channels that you have heard stated were in the original plans and ought to have been cut away?—That I have not investigated to the full extent.

1187. You have heard it?—I have heard the statement; I heard it stated yesterday, and I have heard it stated very frequently before in other places.

1188. In the course of the examination you made in Ireland, and which appears in this Appendix, that was stated, I think?—There are no doubt works originally contemplated which were not executed; I cannot, particularise then, because my attention was never specially directed to that point.

1189. But are the works that were contemplated and not executed now very injurious to the drainage of the Shannon?—That I cannot say; if you were to take the works separately and do any particular bit of work it might perhaps produce very little benefit unless it were combined with a great many other works that are necessary.

1190. The works I am referring to are to a very great extent the very works you yourself suggest to be carried out now?—I think not; they may form a portion of the works I suggested; but I am sure all the works I suggest are in excess of anything ever proposed by the Shannon Commissioners; in many cases I have no doubt what I propose will absorb, as it were, some works proposed by the Commissioners.

1191. You state that it was very wrong to have closed that old channel at Meelick, and that it would be a very great advantage to open it?—I cannot say it was very wrong to close it, but it would be a great advantage to open it, and if the one carries the other you have the answer.

1192. Decidedly, if it would reduce the water?—It would take two to three feet off some of the flooded lands. The whole of the work I propose to execute comes to a very large amount, because I propose to excavate a new channel; simply opening the old channel and leaving it as it was, would not reduce the water two or three feet as I state; it would require all the works I propose to be executed, which are a good deal beyond what were ever contemplated by the Shannon Commissioners to reduce the water to that level.

1193. You have heard it stated by Mr. Penny, that he heard no complaint or little or none along

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the Shannon ?—I did not hear Mr. Penny's evidence.

1194. I can mention it to you; Mr. Penny stated that in the examination he made in making his survey or valuation, he found people along the Shannon were generally satisfied?—I cannot answer that.

1195. In the inquiry you made as to the extent and causes of the Shannon floods, I see that you examined a number of proprietors, tenants, and tenant farmers?—Yes, I heard a great number of complaints.

1196. What was their opinion?—Their opinion varied a great deal, but all their assertions, and all their opinions had to be tested by actual facts, and I must say that I very often found that facts and opinions did not agree.

1197. You examined all these people whose names I see here. I find they complain, many of them, of very large floods; that they have lost a considerable quantity of valuable lands and rents? —Nobody appeared before me except one nobleman, who did not complain of floods. All complained of floods, and the effect of floods. Lord Leitrim most emphatically declared that the Shannon works had wonderfully improved his district; that what was formerly an archipelago of islands was now dry land. Another gentleman no doubt did speak in the same way; but the bulk of the evidence was undoubtedly as you put it, that the people complained of the floods

1198. Particularly Mr. Bourne, whose name you mentioned?—He complained of floods, but he also allowed that the land was freed from water.

1199. I think he stated that his house was scarcely habitable since the works were completed there; they threw so much water back upon it, and that his sewers were stopped. I read it just now?—I do not remember it.

APPENDIX.

LIST OF APPENDIX.

Appendix, No. 1.

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Paper handed in by Colonel *M'Kerlie:*

Tables of the Heights of Water along the River Shannon, when the Lands bordering thereon commence to be Flooded; with the Number of Days in each Month before and after the Works for the Improvement of the Navigation were executed, on which the Lands were more or less Flooded. Compiled from the Records in the Office of Public Works by *James S. Penny*, C.E., Valuator to the Board - - - - - - - - - 75

Appendix, No. 2.

Diagrams delivered in by Mr. *J. S. Penny:*

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Appendix, No. 4.

Letter addressed to the Committee by Mr. *Kelly*, dated 16 May 1868 - - 117

APPENDIX.

Appendix, No. 1.

PAPER handed in by Colonel *M'Kerlie*, 30 April 1868.

App. No. 1.

THE SHANNON INUNDATIONS.

TABLES of the HEIGHTS of WATER along the RIVER SHANNON, when the LANDS bordering thereon commence to be FLOODED; with the Number of Days in each Month before and after the Works for the Improvement of the Navigation were executed, on which the Lands were more or less Flooded. Compiled from the Records in the Office of Public Works by *James S. Penny*, C.E., Valuator to the Board.

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THE RIVER SHANNON—JAMESTOWN REACH. - - - - - -

ALBERT LOCK—UPPER SILL. - - - - - - - -

TABLE A¹.—Showing the Number of Days in each Month in the following Years on which the Water
Old Lock, Upper Sill), being the height at which the Water

The greatest height the water attained is shown

NOTE.—The heights "after the Works" have been assimilated to those "before the Works," by 2 feet 6 inches
than the former Gauge

For $7\frac{11}{12}$ YEARS BEFORE THE WORKS.

YEAR.	January.	February.	March	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1836 -	No Registry	8·10 29	8·7 31	8·0 30	6·8 22	4·7 3	6·11 31	6·11 8	6·8 18	8·0 31	8 10 30	10·6 31	264
1837 -	8·1 31	8·9 28	8·4 31	6·4 30	6·2 31	5·5 26	5·1 12	6·0 29	6·9 27	6·8 31	8·10 30	8 8 31	337
1838 -	8·4 31	7·11 28	8 9 31	7·5 30	6·2 28	– –	4·10 14	6·8 31	6·3 30	6·11 27	8 11 30	8·6 31	311
1839 -	8·5 31	7 11 28	7·8 31	8·0 30	6·3 23	– –	4·11 9	6·0 31	8 5 30	8·3 31	7·3 30	6·11 31	310
1840 -	8·11 31	8·11 29	5·10 31	4·9 14	4·9 2	5 5 30	5·9 31	6 2 31	5·10 30	5·6 29	6·9 30	7·6 31	319
1841 -	6 11 31	6·9 28	6·9 31	6·6 30	5 3 29	4·7 4	5 3 30	6·1 23	6·10 30	7·2 31	7·5 30	8·1 31	328
1842 -	7·9 31	7 6 28	8·2 31	6·9 24	4·8 8	4·9 7	5·5 31	4·10 10	5 3 15	6·0 9	7 6 30	6·11 31	255
1843 -	7·10 31	6 9 28	4·11 18	6·2 28	3·10 31	8·0 30	5·1 24	5·10 31	5·5 23	7·3 28	8·0 30	7·10 31	333
TOTALS -	217	226	235	216	179	100	182	194	203	217	240	248	2,457

- - - - - THE RIVER SHANNON—JAMESTOWN REACH.

- - - - - - - Albert Lock—Upper Sill.

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was at and above 7 feet 1 inch on present Gauge (= 4 feet 7 inches on the former Gauge, is lipping on the low callows above Carrick-on-Shannon.

(in feet and inches) by the first line of figures.

being deducted from the heights "after the Works," as the zero of the present Gauge is 2 feet 6 inches lower (Old Lock, Upper Sill).

For 15 Years after the Works.

Year.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Total.
						June.	July.	Aug.	Sept.				
1853 -	9·6 31	6·0 15	5·1 9	5·4 15	– –	– –	– –	– –	– –	5·0½ 5	6·2 23	4·10 5	103
1854 -	6·3½ 19	6·3 28	4·7 1	– –	– –	– –	– –	– –	– –	5·0 3	4·11 9	6·3 31	91
1855 -	5 3 13	– –	5 5 23	– –	– –	– –	– –	– –	– –	5·0 2	4·10 4	4·8 3	45
1856 -	6·2 31	5·8 24	– –	– –	– –	– –	– –	– –	– –	– –	– –	5·8 24	79
1857 -	5·11 31	5 1 20	4·11 10	5·8 14	5·1 4	– –	– –	– –	– –	– –	4·9½ 5	5·5 27	111
1858 -	6·0½ 21	5 2 18	5·3½ 11	5·3½ 18	4·10 5	– –	– –	– –	– –	– –	– –	6 6 28	101
1859 -	6·2 24	6·0 22	5·4 13	5·3½ 20	– –	– –	– –	– –	4 10½ 15	4·10½ 8	5·3½ 25	5·10 30	157
1860 -	6·5½ 31	6·4 26	5·5 31	5·4 16	– –	5·6½ 29	4·9 2	4·10 14	– –	4·10 12	4·10 5	4·9½ 6	172
1861 -	4·11½ 15	5·0½ 22	5·10½ 31	5·0½ 10	– –	– –	– –	6·4 29	6 3 30	7·0 30	6 1½ 29	6 6 26	222
1862 -	6·4 21	6·4 14	5·4½ 18	4·8½ 11	4·8 1	4·9½ 3	4·8½ 4	– –	– –	5·11½ 15	6·0½ 27	6·3 26	140
1863 -	5·6 31	5 10 19	5·3 23	– –	4·8 4	– –	– –	– –	– –	5·3 10	5·8 30	5·10 24	141
1864 -	4·8 16	5·1 16	– –	4·7 2	– –	– –	– –	– –	– –	– –	6·3 14	6·10 22	70
1865 -	5·7 13	5 4 27	5·3 19	– –	– –	– –	– –	– –	– –	4 9½ 2	6 3½ 14	6·3 20	95
1866 -	6·9 31	5 6 28	4·9½ 11	4·7 1	– –	– –	– –	– –	5·1 16	4·8 5	5·6 22	6·1 31	145
1867 -	6·2 28	6 11 26	6 0 11	5·7 29	5·6 26	– –	– –	– –	– –	6·0 16	5·10½ 10	5·10 13	159
Totals -	356	305	211	136	40	32	6	43	61	108	217	316	1,831

THE RIVER SHANNON—JAMESTOWN REACH. - - - - -

Albert Lock—Upper Sill. - - - - - - - -

Table A^2.—Showing the Number of Days in each Month in the following Years on which the Water was
being the height at which the Water is lipping on the low callows between Jamestown

For $7\frac{11}{12}$ Years before the Works.

Year.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Total.
						June.	July.	Aug.	Sept.				
1836 -	No Registry.	29	31	30	18	–	20	8	18	31	30	31	246
1837 -	31	28	31	30	21	13	1	19	20	31	30	31	286
1838 -	31	28	31	30	19	–	–	29	30	16	30	31	275
1839 -	31	28	31	30	15	–	–	18	30	31	30	31	275
1840 -	31	29	24	–	–	17	31	22	30	12	30	31	257
1841 -	31	26	31	28	7	–	19	12	30	31	30	31	276
1842 -	31	28	31	18	–	–	16	–	4	8	30	31	197
1843 -	31	28	–	6	23	29	3	24	8	26	30	31	239
Totals -	217	224	210	172	103	59	90	132	170	186	240	248	2,051

- - - - THE RIVER SHANNON—JAMESTOWN REACH.

- - - - - - - ALBERT LOCK—UPPER SILL.

at and above 7 feet 6 inches on present Gauge (= 5 feet on the former Gauge, Old Lock, Upper Sill), and Carrick-on-Shannon, and partly flooding them above the latter place.

FOR 15 YEARS AFTER THE WORKS.

YEAR.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1853 -	31	13	3	8	–	–	–	–	–	1	15	–	71
1854 -	19	13	–	–	–	–	–	–	–	1	–	26	59
1855 -	5	–	10	–	–	–	–	–	–	1	–	–	16
1856 -	13	15	–	–	–	–	–	–	–	–	–	14	42
1857 -	27	14	–	12	2	–	–	–	–	–	–	13	68
1858 -	5	3	8	10	–	–	–	–	–	–	–	21	47
1859 -	16	19	8	13	–	–	–	–	–	–	6	19	81
1860 -	31	13	24	6	–	20	–	–	–	–	–	–	94
1861 -	–	3	29	3	–	–	–	24	21	20	19	22	141
1862 -	21	10	11	–	–	–	–	–	–	12	23	25	102
1863 -	20	14	14	–	–	–	–	–	–	5	30	18	101
1864 -	–	4	–	–	–	–	–	–	–	–	11	19	34
1865 -	9	18	9	–	–	–	–	–	–	–	3	16	55
1866 -	31	22	–	–	–	–	–	–	6	–	12	31	102
1867 -	23	22	6	18	17	–	–	–	–	11	7	–	104
TOTALS -	251	183	122	70	19	20	–	24	27	51	126	224	1,117

THE RIVER SHANNON—JAMESTOWN REACH. - - - -

ALBERT LOCK—UPPER SILL. - - - - - - -

TABLE (B.)—Showing the Number of Days in each Month in the following Years, When the water is at 8 feet on present Gauge (= 5 feet 6 inches on former Gauge) a large extent of land (= 6 feet 4 inches on former Gauge) is the greatest

FOR $7\frac{11}{12}$ YEARS BEFORE THE WORKS.

YEAR.	Heights of Water.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	GROSS TOTAL.
							June.	July.	Aug.	Sept.				
1836 -	5 6	No Registry.	29	31	30	10	–	12	8	18	31	30	31	230
	6 0		29	31	30	7	–	9	8	18	31	30	31	224
	6 4		29	31	30	3	–	7	8	11	31	30	31	211
1837 -	5 6	31	28	31	10	14	–	–	13	17	23	30	31	228
	6 0	31	28	18	1	5	–	–	1	14	2	30	31	161
	6 4	30	19	15	1	–	–	–	–	10	1	30	30	136
1838 -	5 6	31	28	31	30	11	–	–	27	22	13	30	31	254
	6 0	31	28	31	30	5	–	–	22	14	6	30	31	228
	6 4	30	28	31	29	–	–	–	10	–	5	30	31	194
1839 -	5 6	31	28	31	30	6	–	–	13	30	31	30	31	261
	6 0	31	28	31	30	2	–	–	2	29	31	28	23	235
	6 4	31	28	31	28	–	–	–	–	28	28	27	7	208
1840 -	5 6	31	28	7 *	–	–	–	16	17	12	2	29	28	170
	6 0	31	28	–	–	–	–	–	4	–	–	16	16	95
	6 4	29	28	–	–	–	–	–	–	–	–	12	13	82
1841 -	5 6	27	28	30	19	–	–	–	11	26	31	30	31	233
	6 0	15	28	10	12	–	–	–	1	15	22	17	31	151
	6 4	14	28	5	7	–	–	–	–	8	20	11	31	124
1842 -	5 6	31	27	31	12	–	–	–	–	–	6	24	31	162
	6 0	31	21	31	7	–	–	–	–	–	1	14	31	136
	6 4	28	11	31	5	–	–	–	–	–	–	12	27	114
1843 -	5 6	31	17	–	5	7	24	–	11	–	25	30	31	181
	6 0	31	12	-	3	–	20	–	–	–	25	30	29	150
	6 4	31	9	–	–	–	18	–	–	–	22	30	24	134
TOTAL	5 6	213	213	192	136	48	24	28	100	125	162	233	245	1,719
	6 0	201	202	152	113	19	20	9	38	90	118	195	223	1,380
	6 4	193	180	144	100	3	18	7	18	57	107	182	194	1,203

* 6 Days no register; not included in the 7.

REMARKS AS TO THE FLOODS FOR $7\frac{11}{12}$ YEARS BEFORE THE WORKS.

1stly. The number of days the water was at and above 5 ft. 6 in. - - =1,719 days, or an average of 217·1 per year.
Ditto - - for the seven months—April to October, inclusive - - - - - - = 815 „ „ 101·9 „
Ditto - - for four months of June, July, August, and September - - - - - = 277 „ „ 34·6 „
2ndly. The number of days the water was at and above 6 ft. 4 in., or the August Flood of 1861 - - - =1,203 „ „ 152· „
Ditto - - for seven months—April to October, inclusive - - - - - - = 310 „ „ 38·7 „
Ditto - - for four months—June to September, inclusive - - - - - - = 100 „ „ 12·5 „

REMARKS AS TO THE FLOODS FOR 15 YEARS AFTER THE WORKS.

1stly. The number of days the water was at and above 8 ft. (= 5 ft. 6 in. before the works) - - - = 492 days, or an average of 32·8 per year.
Ditto - - for the seven months—April to October, inclusive - - - - - - = 62 „ „ 4·1 „
Ditto - - for the four months—June to September, inclusive - - - - - - = 17 „ „ 1·1 „
2ndly. The number of days the water was at and above 8 ft. 10 in., or the August Flood of 1861 (= 6 ft. 4 in. before the works) - - - - = 75 „ „ 5· „
Ditto - - for the seven months—April to October, inclusive - - - - - - = *8 „ „ 0·5 „
Ditto - - for the four months—June to September, inclusive - - - - - - = *2 „ „ 0·01 „

* Occurred in 1861

- - - - THE RIVER SHANNON—JAMESTOWN REACH.

- - - - - - - ALBERT LOCK—UPPER SILL.

" before and after the Works," on which the callows were more or less flooded.

is flooded. At 8 feet 6 inches (= 6 feet on former Gauge) nearly all the callows are flooded. 8 feet 10 inches height the water attained in the August flood of 1861.

FOR 15 YEARS AFTER THE WORKS.

YEAR.	Heights of Water.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	GROSS TOTAL.
							June.	July.	Aug.	Sept.				
1853 -	8 0	31	7	–	–	–	–	–	–	–	–	–	8	46
	8 6	29	2	–	–	–	–	–	–	–	–	–	3	34
	8 10	23	–	–	–	–	–	–	–	–	–	–	–	23
1854 -	8 0	10	9	–	–	–	–	–	–	–	–	–	16	35
	8 8	9	2	–	–	–	–	–	–	–	–	–	7	18
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1855 -	8 0	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 6	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1856 -	8 0	8	7	–	–	–	–	–	–	–	–	–	7	22
	8 8	5	–	–	–	–	–	–	–	–	–	–	–	5
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1857 -	8 0	9	–	–	5	–	–	–	–	–	–	–	–	14
	8 6	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1858 -	8 0	1	–	–	–	–	–	–	–	–	–	–	15	18
	8 8	1	–	–	–	–	–	–	–	–	–	–	8	9
	8 10	–	–	–	–	–	–	–	–	–	–	–	4	4
1859 -	8 0	8	9	–	–	–	–	–	–	–	–	–	7	22
	8 6	1	1	–	–	–	–	–	–	–	–	–	–	2
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1860 -	8 0	22	8	–	–	–	–	–	–	–	–	–	–	30
	8 8	15	3	–	–	–	–	–	–	–	–	–	–	18
	8 10	3	1	–	–	–	–	–	–	–	–	–	–	4
1861 -	8 0	–	–	7	–	–	–	–	14	3	15	10	19	68
	8 6	–	–	–	–	–	–	–	10	2	7	4	10	33
	8 10	–	–	–	–	–	–	–	2	–	6	–	4	12
1862 -	8 0	15	7	–	–	–	–	–	–	–	9	14	13	58
	8 8	5	5	–	–	–	–	–	–	–	–	2	3	15
	8 10	1	1	–	–	–	–	–	–	–	–	–	–	2
1863 -	8 0	4	10	–	–	–	–	–	–	–	–	13	10	37
	8 6	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1864 -	8 0	–	–	–	–	–	–	–	–	–	–	4	16	20
	8 8	–	–	–	–	–	–	–	–	–	–	2	12	14
	8 10	–	–	–	–	–	–	–	–	–	–	–	8	8
1865 -	8 0	3	–	–	–	–	–	–	–	–	–	3	13	19
	8 6	–	–	–	–	–	–	–	–	–	–	2	9	11
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1866 -	8 0	26	2	–	–	–	–	–	–	–	–	2	20	50
	8 8	22	–	–	–	–	–	–	–	–	–	–	2	24
	8 10	15	–	–	–	–	–	–	–	–	–	–	–	15
1867 -	8 0	14	17	5	7	1	–	–	–	–	8	3	–	55
	8 6	6	15	1	–	–	–	–	–	–	2	–	–	24
	8 10	–	7	–	–	–	–	–	–	–	–	–	–	7
TOTALS	8 0	149	78	12	12	1	–	–	14	3	32	49	144	492
	8 6	93	28	1	–	–	–	–	10	2	9	10	54	207
	8 10	42	9	–	–	1	–	–	2	–	6	–	18	75

THE RIVER SHANNON—ROOSKEY REACH. - - - - -

ROOSKEY LOCK—UPPER SILL. - - - - - - -

TABLE A.—Showing the Number of Days, with the greatest Height the Water attained, in each Month when it is lipping

The greatest height the Water attained is shown

Note.—The heights "after the Works" have been corrected approximately, by additions thereto, for the fall

For $7\frac{11}{12}$ YEARS BEFORE THE WORKS.
The water is lipping on callows at 5 feet 11 inches on Gauge (Old Lock, Upper Sill).

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1836 -	No Registry.	8·8 29	8·5 31	7·8 30	6·8 10	– –	6·3 1	6·8 15	7·0 26	8·0 31	8·6 30	9·8 31	234
1837 -	7·9 31	8·10 28	8·4 31	6·5 30	6·6 18	5·11 6	– –	6·0 11	7·0 14	6·7 21	8·4 30	8·3 31	251
1838 -	8·1 31	7·11 28	8·3 31	7·6 30	6·8 13	– –	– –	6·11 23	6·9 27	6·9 7	8·4 30	8·1 31	251
1839 -	8·3 31	7·11 28	7·9 31	8·2 30	6·8 11	– –	– –	6·5 16	8·2 30	8·3 31	7·11 30	7·10 31	269
1840 -	9·4 31	9·4 29	7·3 18	– –	– –	– –	6·2 14	6·3 16	6·2 4	– –	6·9 20	7·7 28	160
1841 -	6·10 27	6·9 25	6·8 25	6·5 19	– –	– –	– –	6·1 7	6·11 25	7·1 31	7·4 30	7·11 31	220
1842 -	7·9 31	7·7 28	8·1 31	6·11 13	– –	– –	– –	– –	– –	6·0 3	7·6 23	7·1 31	160
1843 -	7·6 31	6·10 17	– –	6·3 3	6·3 7	7·11 25	– –	5·11 2	– –	7·3 23	8·2 30	8·0 31	169
TOTAL -	213	212	198	155	59	31	15	90	126	147	223	245	1,714

- - - - - THE RIVER SHANNON—ROOSKEY REACH.

- - - - - - - ROOSKEY LOCK—UPPER SILL.

in the following Years, before and after the Works, on which the Water was at and above the Height on the low callows.

(iu feet and inches) by the first line of figures.

in the surface of the water, between the head of the Old Canal and the present Gauge (New Lock, Upper Sill)

FOR 19 YEARS AFTER THE WORKS.

The water is lipping on callows at 7 feet 2 inches on Gauge (New Lock, Upper Sill).

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept				
1849 -	7·0 23	6·6 10	— —	— —	— —	— —	New Gauge Registry commenced	— —	— —	6·9 14	7·1 30	7·1 29	106
1850 -	6·6 27	6·9 28	5·11 1	— —	— —	— —	— —	— —	— —	— —	6·9 17	6·4 29	102
1851 -	7·7 31	7·0 23	6·2 10	5·11 1	— —	— —	— —	— —	— —	— —	— —	— —	65
1852 -	7·1 27	8·3 29	— —	— —	— —	6·0 5	6·0 7	— —	— —	— —	6·10 25	8·6 31	124
1853 -	9·2 31	6·7 14	6·0 5	6·2 10	— —	— —	— —	— —	— —	5·11 6	6·8 19	5·11 2	87
1854 -	6·11 24	6·10 25	5·11 1	— —	— —	— —	— —	— —	— —	5·11 1	5·11 4	6·11 28	83
1855 -	6·3 6	— —	6·3 17	— —	— —	— —	— —	— —	— —	6·0 5	5·11 2	6·1 2	32
1856 -	6·11 30	6·7 19	— —	— —	— —	— —	— —	— —	— —	— —	— —	6·6 20	69
1857 -	6·7 30	6·3 13	6·1 6	6·6 13	6·1 3	— —	— —	— —	— —	— —	5·11 3	6·4 26	94
1858 -	6·2 13	6·1 10	6·3 10	6·2 17	6·1 3	— —	— —	— —	— —	— —	— —	7·0 27	80
1859 -	6·11 22	6·8 23	6·4 12	6·4 18	— —	— —	— —	— —	6·0 3	6·1 6	6·4 22	6 7 31	137
1860 -	7·5 31	7·4 20	6·6 31	6·6 10	— —	6·6 26	— —	5·11 1	— —	— —	5·11 3	6·0 4	126
1861 -	6·0 10	6·1 18	6·7 31	6·1 5	— —	— —	— —	7·2 24	6·8 26	7·6 20	6·7 20	7·2 23	177
1862 -	6·10 20	6·10 12	6·2 12	— —	— —	5·11 1	— —	— —	— —	6·8 13	6·8 25	6·10 25	108
1863 -	6·4 25	6·8 15	6·2 17	— —	— —	— —	— —	— —	— —	6·2 10	6·7 30	6·8 19	116
1864 -	5·11 6	6·2 13	— —	— —	— —	— —	— —	— —	— —	— —	7·0 13	7·8 22	54
1865 -	6·6 13	6·2 27	6·2 14	— —	— —	— —	— —	— —	— —	5·11 1	7·1 10	7·1 23	88
1866 -	7·8 31	6·6 28	6·0 10	5·10 2	— —	— —	— —	— —	6·3 15	6·0 4	6·3 17	7·0 31	138
1867	7·1 27	7·7 24	6·9 9	6·7 21	6·5 24	— —	— —	— —	— —	6·9 15	6·9 9	5·11 7	136
TOTALS -	427	351	186	97	30	32	7	25	44	95	249	379	1,922

Note.—The zero of gauge on the Upper Sill of this lock is 1 ft. 6 in. lower than the zero of the gauge on the Upper Sill, Old Lock. This 1 ft. 6 in. has been deducted from the heights in this Table to compare with the heights " Before the Works."

THE RIVER SHANNON—ROOSKEY REACH. - - - - - -

ROOSKEY LOCK—UPPER SILL. - - - - - - - -

TABLE B.—Showing the Number of Days in each Month of the following Years, "before above the undermentioned

When the Water is *at 7 feet 7 inches* on the present Gauge, *or 6 feet 5 inches on Gauge,* Gauge (*or 7 feet 2 inches on Gauge, Old Lock, Upper Sill*) is the

FOR $7\frac{11}{12}$ YEARS BEFORE THE WORKS.

YEARS.	Heights of Water on Gauge, *Old Lock,* Upper Sill.		January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage. June.	July.	Aug.	Sept.	October.	November.	December.	TOTALS.
	Ft.	*in.*													
1836 -	6	5	No Registry.	29	30	30	4	–	–	10	24	31	30	31	219
	7	2		22	21	17	–	–	–	–	–	29	30	31	150
1837 -	6	5	31	28	23	1	6	–	–	–	13	8	30	31	171
	7	2	27	19	12	–	–	–	–	–	–	–	27	29	114
1838 -	6	5	31	28	31	30	6	–	–	13	17	4	30	31	221
	7	2	25	28	31	16	–	–	–	–	–	–	26	31	157
1839 -	6	5	31	28	31	30	4	–	–	1	29	31	30	31	246
	7	2	31	28	30	25	–	–	–	–	23	30	25	21	213
1840 -	6	5	31	29	11	–	–	–	–	–	–	–	14	14	99
	7	2	31	29	1	–	–	–	–	–	–	–	–	7	68
1841 -	6	5	14	16	9	4	–	–	–	–	14	19	14	31	121
	7	2	–	–	–	–	–	–	–	–	–	–	3	31	34
1842 -	6	5	30	19	31	6	–	–	–	–	–	–	12	31	129
	7	2	8	5	26	–	–	–	–	–	–	–	7	–	46
1843 -	6	5	31	11	–	–	–	20	–	–	–	21	30	27	140
	7	2	17	–	–	–	–	14	–	–	–	3	14	8	56
TOTAL at	6	5	199	188	166	101	20	20	–	24	97	114	190	227	1,346
TOTAL at	7	2	139	131	121	58	–	14	–	–	23	62	132	158	838

REMARKS AS TO THE FLOODS FOR THE $7\frac{11}{12}$ YEARS BEFORE THE WORKS.

1stly. The number of days the *water was at and above* 6 ft. 5 in. - - =1,346 days, or an average of 170 per year.

Ditto - - for the *seven months—April to October,* inclusive - - - - - = 376 " " 47 "

Ditto - - for *four months—June to September,* inclusive - - - - - - = 141 " " 17·6 "

2ndly. The number of days the *water was at and above* 7 ft. 2 in., or *the August flood of* 1861 - - - = 638 " " 105·8 "

Ditto - - for the *seven months—April to October,* inclusive - - - - - - = 157 " " 19·6 "

Ditto - - for *four months—June to September,* inclusive - - - - - - = 37 " " 4·6 "

REMARKS AS TO THE FLOODS FOR 19 YEARS AFTER THE WORKS.

1stly. The number of days the *water was at and above* 7 ft. 7 in. - - = 825 days, or an average of 43·5 per year.

Ditto - - for the *seven months—April to October,* inclusive - - - - - - = 74 " " 3·9 "

Ditto - - for *four months—June to September,* inclusive - - - - - - = 18 " " 0·95 "

2ndly. The number of days the *water was at and above the August flood* of 1861 - - - - - - = 160 " " 8·4 "

Ditto - - for *the seven months—April to October,* inclusive - - - - - - = *6 " " 0·42 "

Ditto - - for *four months—June to September,* inclusive - - - - - - = *2 " " 0·1 "

* Occurred in 1861.

- - - - - THE RIVER SHANNON—ROOSKEY REACH.

- - - - - - - Rooskey Lock—Upper Sill.

and after the Works," on which the Callows were flooded, when the Water was at and Heights respectively.

Old Lock, Upper Sill, a large extent of Land is flooded. 8 *feet* 2 *inches* on the present *greatest Height the Water attained in the August flood of* 1861.

For 19 Years after the Works.

Years.	Heights of Water on Gauge, *New Lock,* Lower Sill.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Totals.
							June.	July.	Aug.	Sept.				
	Ft. in.													
1849 -	7 7	18	5	–	–	–	–	–	–	–	7	28	21	79
	8 2	–	–	–	–	–	–	New gauge	–	–	–	4	2	6
1850 -	7 7	3	18	–	–	–	–	–	–	–	–	11	2	34
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1851 -	7 7	23	19	–	–	–	–	–	–	–	–	–	–	42
	8 2	9	4	–	–	–	–	–	–	–	–	–	–	13
1852 -	7 7	20	23	–	–	–	–	–	–	–	–	17	27	87
	8 2	7	16	–	–	–	–	–	–	–	–	–	12	35
1853 -	7 7	31	8	–	–	–	–	–	–	–	–	8	–	47
	8 2	24	–	–	–	–	–	–	–	–	–	–	–	24
1854 -	7 7	12	9	–	–	–	–	–	–	–	–	–	17	38
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1855 -	7 7	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1856 -	7 7	7	7	–	–	–	–	–	–	–	–	–	6	20
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1857 -	7 7	12	–	–	5	–	–	–	–	–	–	–	5	22
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1858 -	7 7	–	–	–	–	–	–	–	–	–	–	–	18	18
	8 2	–	–	–	–	–	–	–	–	–	–	–	2	2
1859 -	7 7	10	14	5	1	–	–	–	–	–	–	5	11	46
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1860 -	7 7	25	7	4	3	–	2	–	–	–	–	–	–	41
	8 2	9	2	–	–	–	–	–	–	–	–	–	–	11
1861 -	7 7	–	–	17	–	–	–	–	13	3	14	5	18	70
	8 2	–	–	–	–	–	–	–	2	–	6	–	1	9
1862 -	7 7	16	7	–	–	–	–	–	–	–	11	15	18	67
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1863 -	7 7	6	10	–	–	–	–	–	–	–	–	23	13	52
	8 2	–	–	–	–	–	–	–	–	–	–	–	–	–
1864 -	7 7	–	–	–	–	–	–	–	–	–	–	6	17	23
	8 2	–	–	–	–	–	–	–	–	–	–	1	12	13
1865 -	7 7	4	–	–	–	–	–	–	–	–	–	3	14	21
	8 2	–	–	–	–	–	–	–	–	–	–	1	10	11
1866 -	7 7	27	11	–	–	–	–	–	–	–	–	–	21	59
	8 2	21	–	–	–	–	–	–	–	–	–	–	3	24
1867 -	7 7	16	19	5	6	1	–	–	–	–	8	4	–	59
	8 2	1	11	–	–	–	–	–	–	–	–	–	–	12
Total at	7 7	230	157	31	15	1	2	–	13	3	40	125	208	825
Total at		71	33	–	–	–	–	–	2	–	6	6	42	160

THE RIVER SHANNON—TARMONBARRY REACH. - - - -

CLOONDRAH LOCK—UPPER SILL. - - - - - - - -

TABLE A.—Showing the Number of Days, with the greatest Height the Water attained in each Month of
10 inches on the Gauge—7 feet 10 inches being the

The greatest height the Water attained is shown

FOR 8$\frac{11}{12}$ YEARS BEFORE THE WORKS.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1836 -	No Registry.	10·9 29	9·8 31	9·7 30	8·1 6	– –	– –	8·1 8	8·0 11	8·10 30	9·2 30	10·10 31	206
1837 -	9·2 31	9·9 28	9·6 31	8·2 16	– –	– –	– –	– –	8·11 14	8·6 31	9·11 30	9·5 31	212
1838 -	9·2 31	8·9 28	10·6 31	8·9 30	7·10 1	– –	– –	7·10 9	– –	8·0 3	9·8 29	9·4 31	193
1839 -	9·1 31	9·0 28	8·9 31	8·10 30	8·0 4	– –	– –	8·0 6	9·2 29	9·6 31	9·4 30	8·10 31	251
1840 -	10·3 31	10·3 29	8·1 5	– –	– –	– –	7·10 3	– –	– –	– –	8·11 15	10·3 24	107
1841 -	8·10 15	8·7 22	8·7 20	7·11 13	– –	– –	– –	7·11 6	9·0 19	8·11 27	9·2 24	9·6 31	177
1842 -	9·4 31	9·2 28	9·9 31	8·7 8	– –	– –	– –	– –	– –	– –	9·5 15	8·6 31	144
1843 -	9·5 31	8·7 13	– –	8·2 3	8·0 2	9·7 23	– –	8·4 13	8·6 10	9·5 25	10·7 30	9·8 31	181
1844 -	9·10 31	9·5 29	9·7 31	8·6 20	– –	– –	– –	7·11 8	8·0 3	9·4 22	9·3 30	8·2 12	186
TOTALS -	232	234	211	150	13	23	3	50	86	169	233	253	1,657

THE RIVER SHANNON—TARMONBARRY REACH.

CLOONDRAH LOCK—UPPER SILL.

the following Years, before and after the Works, respectively, on which the Water was at and above 7 feet Height at which the Water is lipping on the low Callows.

(in feet and inches) by the first line of figures.

FOR 19 YEARS AFTER THE WORKS.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1849	8·8 16	– –	– –	– –	– –	– –	– –	– –	– –	9·3 8	8·10 30	9·0 17	71
1850	8·0 6	8·8 21	– –	– –	– –	– –	– –	– –	– –	– –	8·3 12	7·10 3	42
1851	9·10½ 23	8·11 17	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	40
1852	9·3 21	10·0 22	– –	– –	– –	– –	– –	– –	– –	– –	9·7 22	10·6 31	96
1853	10·9 31	8·0 7	7·10 2	8·2 7	– –	– –	– –	– –	– –	8·0 3	8·6 10	– –	60
1854	9·3 23	8·3 6	– –	– –	– –	– –	– –	– –	– –	– –	– –	8·8 18	47
1855	7·10 1	– –	– –	– –	– –	– –	– –	– –	– –	– –	7·11 2	8·2 3	6
1856	8·5 12	8·0 12	– –	– –	– –	– –	– –	– –	– –	– –	– –	8·3 10	34
1857	8·11 18	– –	– –	8·3 11	– –	– –	– –	– –	– –	– –	– –	8·0 10	39
1858	8·2 7	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	8·10 15	22
1859	8·6 17	8·6 6	8·3 11	8·4 6	– –	– –	– –	– –	– –	– –	– –	8·4 14	54
1860	9·4 23	9·3 5	8·0 4	7·10 1	– –	7·10 2	– –	– –	– –	– –	– –	– –	35
1861	– –	– –	8·5 6	– –	– –	– –	– –	8·10 14	8·11 6	9·2 14	8·7 10	8·8 17	67
1862	8·8 16	8·6 6	– –	– –	– –	– –	– –	– –	– –	8·4 8	8·5 12	8·7 13	55
1863	8·0 5	7·10½ 4	– –	– –	– –	– –	– –	– –	– –	– –	8·8 21	8·3½ 10	40
1864	– –	7 10 1	– –	– –	– –	– –	– –	– –	– –	– –	8·11½ 12	9·7 16	29
1865	82 5	8·1 6	– –	– –	– –	– –	– –	– –	– –	– –	9·7½ 4	8·10½ 13	28
1866	9·2 25	7·10½ 4	– –	– –	– –	– –	– –	– –	– –	– –	8·0 4	8·11 19	52
1867	9·0½ 15	9·4½ 18	8·1 6	8·2½ 4	8·0 1	– –	– –	– –	– –	8·5 7	8·1 1	– –	52
TOTALS	264	135	29	29	1	2	–	14	6	40	140	209	869

THE RIVER SHANNON—TARMONBARRY REACH. - - - -

Cloondrah Lock—Upper Sill. - - - - - -

Table B.—Showing the Number of Days in each Month of the following Years, "before and after the of Land is flooded. At 8 feet 6 inches on Gauge nearly all the Callows are flooded.

For $6\frac{11}{12}$ Years before the Works.

Years.	Heights of Water.	January.	February.	March.	April	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Total.
							June.	July.	Aug.	Sept.				
1836	8 2	No Registry	29	31	27	–	–	–	–	–	29	30	31	177
	8 6		29	30	22	–	–	–	–	–	25	22	31	159
	8 10		24	25	16	–	–	–	–	–	5	18	31	119
1837	8 2	27	18	29	1	–	–	–	–	13	21	30	31	170
	8 6	21	17	17	–	–	–	–	–	12	4	30	26	127
	8 10	13	16	7	–	–	–	–	–	3	–	14	17	70
1838	8 2	27	28	31	21	–	–	–	–	–	–	24	30	161
	8 6	15	22	31	14	–	–	–	–	–	–	17	24	123
	8 10	9	–	17	–	–	–	–	–	–	–	11	19	56
1839	8 2	31	28	31	28	–	–	–	–	28	31	29	21	227
	8 6	31	26	22	19	–	–	–	–	23	31	26	11	189
	8 10	9	17	–	3	–	–	–	–	21	22	16	1	89
1840	8 2	31	29	–	–	–	–	–	–	–	–	11	15	86
	8 6	28	26	–	–	–	–	–	–	–	–	9	12	75
	8 10	18	23	–	–	–	–	–	–	–	–	4	7	52
1841	8 2	15	19	9	–	–	–	–	–	16	18	14	31	122
	8 6	14	4	2	–	–	–	–	–	6	15	10	31	82
	8 10	1	–	–	–	–	–	–	–	3	5	9	31	49
1842	8 2	31	20	31	5	–	–	–	–	–	–	14	28	129
	8 6	26	14	30	3	–	–	–	–	–	–	10	6	89
	8 10	14	7	26	–	–	–	–	–	–	–	6	–	53
Total at	8 2	162	171	162	82	–	–	–	–	57	99	152	187	1,072
Total at	8 6	135	138	132	58	–	–	–	–	41	75	124	141	844
Total at	8 10	64	87	75	19	–	–	–	–	27	32	78	106	488

Remarks as to the Floods for the $6\frac{11}{12}$ Years before the Works.

1stly. The number of days the water was at and above 8 ft. 2 in. - =1,072 days, or an average of 155 per year.
Ditto - - for the seven months—April to October, inclusive - - - - - - = 238 " " 34 "
Ditto - - for the four months—June to September, inclusive - - - - - - = 57 " " 8·1 "
2ndly. The number of days the water was at and above the height of the August flood of 1861 - - - = 488 " " 70·5 "
Ditto - - for the seven months—April to October, inclusive - - - - - - = 78 " " 11·1 "
Ditto - - for the four months—June to September, inclusive - - - - - - = 27 " " 3·9 "

Remarks as to the Floods for the 19 Years after the Works.

1stly. The number of days the water was at and above 8 ft. 2 in. - - = 516 days, or an average of 27·2 per year.
Ditto - - for the seven months—April to October, inclusive - - - - - - = 37 " " 2 "
Ditto - - for the four months—June to September, inclusive - - - - - - = *13 " " 0·7 "
2ndly. The number of days the water was at and above the height of the August flood of 1861 - - - = 173 " " 9·1 "
Ditto - - for the seven months—April to October, inclusive - - - - - - = *9 " " 0·5 "
Ditto - - for the four months—June to September, inclusive - - - - - - = *3 " " 0·16 "

* All occurred in 1861.

- - - - THE RIVER SHANNON—TARMONBARRY REACH.

- - - - - - - CLOONDRAH LOCK—UPPER SILL.

Works," on which the Callows were flooded. When the Water is at 8 feet 2 inches on Gauge a large extent 8 feet 10 inches is the greatest Height the Water attained in the August flood of 1861.

FOR 19 YEARS AFTER THE WORKS.

YEARS.	Heights of Water.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
							June.	July.	Aug.	Sept.				
1849 -	8 2	10	–	–	–	–	–	–	–	–	7	23	10	50
	8 6	3	–	–	–	–	–	–	–	–	6	9	5	23
	8 10	–	–	–	–	–	–	–	–	–	3	1	4	8
1850 -	8 2	–	7	–	–	–	–	–	–	–	–	1	–	8
	8 6	–	4	–	–	–	–	–	–	–	–	–	–	4
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1851 -	8 2	17	13	–	–	–	–	–	–	–	–	–	–	30
	8 6	13	6	–	–	–	–	–	–	–	–	–	–	19
	8 10	10	2	–	–	–	–	–	–	–	–	–	–	12
1852 -	8 2	20	20	–	–	–	–	–	–	–	–	20	31	91
	8 6	16	18	–	–	–	–	–	–	–	–	19	31	84
	8 10	11	18	–	–	–	–	–	–	–	–	15	31	75
1853 -	8 2	28	–	3	–	–	–	–	–	–	–	9	–	40
	8 6	25	–	–	–	–	–	–	–	–	–	1	–	26
	8 10	22	–	–	–	–	–	–	–	–	–	–	–	22
1854 -	8 2	23	2	–	–	–	–	–	–	–	–	–	12	37
	8 6	19	–	–	–	–	–	–	–	–	–	–	10	29
	8 10	6	–	–	–	–	–	–	–	–	–	–	–	6
1855 -	8 2	–	–	–	–	–	–	–	–	–	–	–	2	2
	8 6	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1856 -	8 2	7	–	–	–	–	–	–	–	–	–	–	5	12
	8 6	–	–	–	–	–	–	–	–	–	–	–	–	–
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1857 -	8 2	13	–	–	1	–	–	–	–	–	–	–	–	14
	8 6	8	–	–	–	–	–	–	–	–	–	–	–	8
	8 10	1	–	–	–	–	–	–	–	–	–	–	–	1
1858 -	8 2	2	–	–	–	–	–	–	–	–	–	–	10	12
	8 6	–	–	–	–	–	–	–	–	–	–	–	10	10
	8 10	–	–	–	–	–	–	–	–	–	–	–	1	1
1859 -	8 2	13	3	6	3	–	–	–	–	–	–	–	7	32
	8 6	6	3	–	–	–	–	–	–	–	–	–	–	9
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1860 -	8 2	21	3	–	–	–	–	–	–	–	–	–	–	24
	8 6	17	3	–	–	–	–	–	–	–	–	–	–	20
	8 10	9	2	–	–	–	–	–	–	–	–	–	–	11
1861 -	8 2	–	–	2	–	–	–	–	10	3	9	6	12	42
	8 6	–	–	–	–	–	–	–	5	2	7	5	7	26
	8 10	–	–	–	–	–	–	–	1	2	3	–	–	6
1862 -	8 2	10	3	–	–	–	–	–	–	–	1	2	5	21
	8 6	5	2	–	–	–	–	–	–	–	–	–	1	8
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1863 -	8 2	–	–	–	–	–	–	–	–	–	–	6	1	7
	8 6	–	–	–	–	–	–	–	–	–	–	1	–	1
	8 10	–	–	–	–	–	–	–	–	–	–	–	–	–
1864 -	8 2	–	–	–	–	–	–	–	–	–	–	4	14	18
	8 6	–	–	–	–	–	–	–	–	–	–	2	11	13
	8 10	–	–	–	–	–	–	–	–	–	–	1	8	9
1865 -	6 2	2	–	–	–	–	–	–	–	–	–	3	10	15
	8 6	–	–	–	–	–	–	–	–	–	–	2	7	9
	8 10	–	–	–	–	–	–	–	–	–	–	2	1	3
1866 -	8 2	22	–	–	–	–	–	–	–	–	–	–	9	31
	8 6	20	–	–	–	–	–	–	–	–	–	–	4	24
	8 10	9	–	–	–	–	–	–	–	–	–	–	1	10
1867 -	8 2	11	16	–	1	–	–	–	–	–	2	–	–	30
	8 6	8	8	–	–	–	–	–	–	–	–	–	–	16
	8 10	2	7	–	–	–	–	–	–	–	–	–	–	9
TOTAL at	8 2	199	67	11	5	–	–	–	10	3	19	74	128	516
TOTAL at	8 6	140	44	–	–	–	–	–	5	2	13	39	86	329
TOTAL at	8 10	70	29	–	–	–	–	–	1	2	6	19	46	173

THE RIVER SHANNON—LOUGH REE REACH. - - - - -

ATHLONE LOCK—UPPER SILL. - - - - - - - -

TABLE A.—Showing the Number of Days, with the greatest Height the Water attained, in each Month at which it is lipping on the low callows

The greatest Height the Water attained is shown

NOTE.—The heights "after the Works" have been corrected approximately, by additions thereto, for the fall

FOR $8\frac{11}{12}$ YEARS BEFORE THE WORKS.

The Water is lipping on Callows at 6 feet (on former Gauge, Old Lock, Upper Sill).

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1836 -	– No Registry.	7·9 5	8·3 31	8·3 30	7·0 19	– –	– –	6·3 21	7·5 28	8·11 31	10·1 30	12·4 31	224
1837 -	10·4 31	11·0 28	11·0 31	7·9 30	7·3 31	6·7 30	6·4 28	6·6 31	7·0 30	7·0 31	9·8 30	9·9 31	362
1838 -	9·9 31	9·1 28	10·3 41	9·4 30	8·0 31	6·9 30	6·0 19	7·4 31	7·4 30	6·10 31	8·11 30	9·6 31	353
1839 -	9·10 31	9·9 28	9·4 31	9·1 30	7·11 31	6·5 30	6·6 9	7·2 31	9·3 30	10·2 31	9·11 30	9·5 31	343
1840 -	11·5 31	12·4 29	10·3 31	6·11 30	6·0 12	6·5 30	7·0 31	7·6 31	7·9 30	7·3 31	8·6 30	9·6 31	347
1841 -	8·7 31	8·7 28	8·6 31	8·4 30	7·3 31	6·6 23	6·3 23	7·1 30	8·1 30	9·0 31	9·1 30	10·5 31	349
1842 -	9·9 31	9·9 28	10·2 31	9·8 30	6·11 31	6·4 23	6·6 30	6·5 28	6·3 20	6·3 28	9·1 30	9·1 31	341
1843 -	9·6 31	9·3 28	7·5 31	7·6 30.	7·11 31	9·6 30	8·0 31	7·4 31	7·6 30	8·9 31	10·11 30	10·9 31	365
1844 -	9·7 31	8·9 29	9·8 31	8·1 30	7·0 31	6·10 27	6·9 31	7·4 31	6·11 30	8·6 31	8·10 30	8·1 31	363
TOTALS -	248	231	279	270	248	223	202	265	256	276	270	279	3,047

- - - - - - THE RIVER SHANNON—LOUGH REE REACH.

- - - - - - - - ATHLONE LOCK—UPPER SILL.

of the following Years, before and after the Works, on which the Water was at and above the Height between the Head of Lough Ree and Tarmonbarry.

(in feet and inches) by the first line of figures.

in the surface of the Water, between the Head of the Old Canal and the present Gauge at this Lock, Upper Sill.

FOR 18½ YEARS AFTER THE WORKS.

The Water is lipping on Callows at 8 feet 2 inches on present Gauge, New Lock, Upper Sill.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1849 -	No Registry.	No Registry.	No Registry.	No Registry.	No Registry.	No Registry.	6·7½ 20	8·9 31	9·3½ 27	8·5½ 31	8·11½ 30	8·11½ 31	170
1850 -	8·0½ 31	8·11½ 28	7·8½ 19	6·5½ 12	6·7½ 12	– –	– –	– –	– –	– –	6·10 12	6·8½ 31	145
1851 -	8·5½ 31	8·0½ 28	6·4½ 11	6·3½ 6	– –	– –	– –	– –	– –	– –	– –	– –	76
1852 -	8·1½ 24	9·4½ 28	6·8½ 8	– –	– –	– –	6·0½ 2	– –	– –	– –	7·8½ 23	9·4½ 31	116
1853 -	10·4½ 31	7·10½ 20	– –	6·4½ 11	– –	– –	– –	– –	– –	6·0½ 1	7·0½ 26	6·2½ 5	94
1854 -	7·8½ 21	7·7½ 26	– –	– –	– –	– –	– –	– –	– –	– –	– –	6·10½ 17	64
1855 -	6·9½ 13	– –	6·8½ 16	– –	– –	– –	– –	– –	– –	– –	– –	– –	29
1856 -	7·0½ 29	6·9½ 24	6·0½ 2	– –	– –	– –	– –	– –	– –	– –	– –	6·9½ 23	78
1857 -	7·1½ 31	6·4½ 18	6·5½ 12	6·8½ 10	6·8½ 7	– –	– –	– –	– –	– –	– –	6·4½ 10	88
1858 -	6·2½ 9	6·3½ 7	6·2½ 3	6·5½ 15	6·2½ 1	– –	– –	– –	– –	– –	– –	7·5½ 19	54
1859 -	7·5½ 25	7·1½ 25	6·8½ 16	6·7½ 21	– –	– –	– –	– –	– –	– –	6·2½ 12	6·9½ 26	125
1860 -	8·4½ 31	8·4½ 25	6·5½ 31	6·5½ 17	– –	6·7½ 21	6·3½ 3	– –	– –	– –	– –	6·3½ 10	138
1861 -	6·3½ 7	6·4½ 13	7·0½ 31	6·7½ 13	– –	– –	– –	7·5 19	7·0½ 22	7·10½ 30	7·1½ 12	7·8½ 31	178
1862 -	7·8½ 19	7·10½ 20	6·5½ 13	6·5½ 15	6·2½ 7	– –	– –	– –	– –	6·9½ 11	7·2½ 30	7·5½ 25	140
1863 -	7·0½ 31	6·9½ 21	6·5½ 15	– –	– –	– –	– –	– –	– –	6·2½ 9	7·6½ 30	7·5½ 27	133
1864 -	6·0½ 7	6·5½ 17	6·2½ 1	– –	– –	– –	– –	– –	– –	– –	7·1½ 11	8·4½ 30	66
1865 -	6·8½ 15	6·9½ 28	6·7½ 15	– –	– –	– –	– –	– –	– –	– –	6·9½ 4	7·5½ 31	93
1866 -	8·4½ 31	7·4½ 28	6·6½ 8	– –	– –	– –	– –	– –	6·1½ 7	6·0½ 2	6·6½ 14	7·5½ 31	121
1867 -	7·8½ 31	8·4½ 28	6·8½ 19	6·11½ 29	6·11½ 29	6·2½ 4	– –	– –	– –	7·3½ 10	7·4½ 15	6·2½ 2	167
TOTALS -	417	384	220	149	56	25	25	50	56	94	219	380	2,075

Note.—The Upper Sill of this Lock is 2 feet 3½ inches lower than the Upper Sill of Old Lock. This 2 feet 3½ inches has been deducted from the heights in this Table, to compare with the heights before the Works.

THE RIVER SHANNON—LOUGH REE REACH. - - - - -

Athlone Lock—Upper Sill. - - - - - - -

Table B.—Showing the number of Days in each Month of the following Years, "before and after the Water was at and above the

When the Water is *at* 8 *feet* 8 *inches*, on the present Gauge, *or* 6 *feet* 9 *inches on former Gauge*, *Gauge* is the *greatest Height the Water*

For $8\frac{11}{12}$ Years before the Works.

Years.	Heights of Water on Gauge, Old Lock, Upper Sill.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Total.
							June.	July.	August.	Sept.				
1836 -	6 9	No Registry	5	31	30	19	–	–	–	13	31	30	31	190
	7 5		5	23	28	–	–	–	–	3	30	30	31	150
1837 -	6 9	31	28	31	30	30	–	–	–	10	31	30	31	252
	7 5	31	28	31	11	–	–	–	–	–	–	28	31	160
1838 -	6 9	31	28	31	30	31	5	–	20	30	6	30	31	273
	7 5	31	28	31	30	15	–	–	–	–	–	24	31	190
1839 -	6 9	31	28	31	30	23	–	–	26	30	31	30	31	291
	7 5	31	28	31	30	11	–	–	–	28	31	30	31	251
1840 -	6 9	31	29	31	7	–	–	16	31	30	15	23	31	244
	7 5	31	29	24	–	–	–	–	8	9	–	17	31	149
1841 -	6 9	31	28	31	30	20	–	–	6	30	31	30	31	268
	7 5	31	28	31	28	–	–	–	–	28	31	30	31	238
1842 -	6 9	31	28	31	30	5	–	–	–	–	–	18	31	174
	7 5	31	28	31	23	–	–	–	–	–	–	11	31	155
1843 -	6 9	31	28	22	26	31	30	31	31	30	31	30	31	352
	7 5	31	28	1	2	26	28	16	–	10	20	30	31	223
1844 -	6 9	31	29	31	30	21	–	3	25	7	23	30	31	261
	7 5	31	29	31	15	–	–	–	–	–	20	30	17	173
Total at	6 9	248	231	270	243	180	35	50	139	180	199	251	279	2,305
Total at	7 5	248	231	234	167	52	28	16	8	78	132	230	2	1,689

Remarks as to the Floods for the $8\frac{11}{12}$ Years before the Works.

1stly. The number of days the water wes *at and* ABOVE 6 ft. 9 in. - - - = 2,305 days, or an average of 258·5 per year.

Ditto - - for the *seven months—April to October, inclusive* - - = 1,026 „ „ 114 „

Ditto - - for *four months — June to September, inclusive* - = 404 „ „ 44·9 „

2ndly. The number of days the water was *at and above the height of the Autumn flood of* 1861 - - - = 1,689 „ „ 189·4 „

Ditto - - for the *seven months—April to October, inclusive* - = 481 „ „ 53·4 „

Ditto - - for the *four months, June to September, inclusive* - - = 130 „ „ 14·4 „

Remarks as to the Floods for 18½ Years after the Works.

1stly. The number of days the water was at and above 8 ft. 8 in. - - - = 1,044 days, or an average of 56·4 per year.

Ditto - - for the *seven months—April to October, inclusive* - = 139 „ „ 7·5 „

Ditto - - for *four months—June to September, inclusive* - = *59 „ „ 3·2 „

2ndly. The number of days the water *was at and above the height of the August flood of* 1861 - - - = 427 „ „ 23·1 „

Ditto - - for the *seven months—April to October, inclusive* - = 53 „ „ 2·9 „

Ditto - - for *four months—June to September, inclusive* - - = *31 „ „ 1·7 „

* *Part occurred in* 1849, *and the remainder in* 1861.

- - - - THE RIVER SHANNON—LOUGH REE REACH.

- - - - - - ATHLONE LOCK—UPPER SILL.

the Works," on which the Callows were flooded between the Head of Lough Ree and Tarmonbarry, when undermentioned Heights respectively.

a large extent of Land is flooded—*9 feet 3 inches* on the present Gauge, or *7 feet 5 inches on former attained in the August flood of* 1861.

FOR 18½ YEARS AFTER THE WORKS.

YEARS.	Heights of Water on Gauge, New Lock, Upper Sill	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
							June.	July.	Aug.	Sept.				
1849 -	8 8	- New Gauge from July -					–	–	24	17	28	30	31	130
	9 3						–	–	16	12	9	30	31	98
1850 -	8 8	31	28	10	–	–	–	–	–	–	–	7	2	78
	9 3	10	28	3	–	–	–	–	–	–	–	–	–	41
1851 -	8 8	23	22	–	–	–	–	–	–	–	–	–	–	45
	9 3	16	14	–	–	–	–	–	–	–	–	–	–	30
1852 -	8 8	20	29	1	–	–	–	–	–	–	–	20	31	101
	9 3	10	24	–	–	–	–	–	–	–	–	7	19	60
1853 -	8 8	31	12	–	–	–	–	–	–	–	–	10	–	53
	9 3	31	6	–	–	–	–	–	–	–	–	–	–	37
1854 -	8 8	19	14	–	–	–	–	–	–	–	–	–	13	46
	9 3	5	6	–	–	–	–	–	–	–	–	–	–	11
1855 -	8 8	3	–	4	–	–	–	–	–	–	–	–	–	7
	6 3	–	–	–	–	–	–	–	–	–	–	–	–	–
1856 -	8 8	8	8	–	–	–	–	–	–	–	–	–	8	24
	9 3	–	–	–	–	–	–	–	–	–	–	–	–	–
1857 -	8 8	25	–	–	3	2	–	–	–	–	–	–	–	30
	9 3	-	–	–	–	–	–	–	–	–	–	–	–	–
1858 -	8 8	–	–	–	–	–	–	–	–	–	–	–	12	12
	9 3	–	–	–	–	–	–	–	–	–	–	–	4	4
1859 -	8 8	13	18	2	–	–	–	–	–	–	–	–	3	36
	9 3	1	–	–	–	–	–	–	–	–	–	–	–	1
1860 -	8 8	31	15	–	–	–	–	–	–	–	–	–	–	46
	9 3	18	8	-	–	–	–	–	–	–	–	–	–	26
1861 -	8 8	–	–	21	–	–	–	–	15	3	21	5	25	90
	9 3	–	–	–	–	–	–	–	3	–	13	–	9	25
1862 -	8 8	13	13	–	–	–	–	–	–	–	4	23	20	73
	9 3	9	7	–	–	–	–	–	–	–	–	–	2	18
1863 -	8 8	11	7	–	–	–	–	–	–	–	–	27	19	64
	9 3	–	–	–	–	–	–	–	–	–	–	4	3	7
1864 -	8 8	–	–	–	–	–	–	–	–	–	–	7	22	29
	9 3	–	–	–	–	–	–	–	–	–	–	–	17	17
1865 -	8 8	1	6	–	–	–	–	–	–	–	–	1	17	25
	9 3	–	–	–	–	–	–	–	–	–	–	–	3	3
1866 -	8 8	29	20	–	–	–	–	–	–	–	–	–	27	76
	9 3	24	–	–	–	–	–	–	–	–	–	–	3	27
1867 -	8 8	19	27	3	6	11	–	–	–	–	5	8	–	79
	9 3	3	19	–	–	–	–	–	–	–	–	–	–	22
TOTAL at	8 8	277	219	41	9	13	–	–	39	20	58	138	230	1,044
TOTAL at	9 3	127	112	3	–	–	–	–	19	12	22	41	91	427

THE RIVER SHANNON—MEELICK REACH - - - - - -

SHANNON BRIDGE. - - - - - - - - -

TABLE A.—Showing the Number of Days, with the greatest Height the Water attained, was at and above the Height at which The greatest Height the Water attained is shown

FOR $6\frac{1}{12}$ YEARS BEFORE THE WORKS.

The Water is lipping on Callows at 6 feet 8 inches on former Gauge, Upper Sill.

YEARS	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1836 -	No Registry	9·0 5*	9·8 31	9·8 30	8·7 26	6·8 2	7·8 2	7·8 31	8·7 30	10·0 31	10·7 30	12·1 31	219
1837 -	10·9 31	11·9 28	10·11 31	8·1 30	7·8 31	7·0 13	7·2 3	7·3 31	8·2 26	7·8 31	10·9 30	10·5 31	346
1838 -	10·2 31	10·6 28	10·3 31	9·6 30	8·4 27	6·10 7	7·1 11	8·10 31	8·2 30	7·11 31	10·1 30	10·4 31	318
1839 -	10·6 31	10·2 15†	– -	– No Registry kept	–	– -	7·11 7	8·5 31	10·9 30	11·2 31	11·0 30	10·2 31	206
1840 -	12·1 31	12·9 29	10·5 31	7·2 8	– –	7·0 4	7·10 21	8·9 31	8·8 30	7·7 31	9·4 30	10·6 31	277
1841 -	9·6 31	9·0 28	9·0 31	8·8 30	7·9 31	6·8 2	6·9 6	7·10 19	9·1 30	9·10 31	10·0 30	11·1 31	300
1842 -	10·6 31	10·3 28	11·0 31	10·3 30	7·0 27	– –	6·10 16	– –	– –	– –	9·10 28	9·6 31	222
TOTALS -	186	161	186	158	142	28	66	174	176	186	208	217	1,888

* Registry for only 5 days.

† Registry for only 15 days.

- - - - - THE RIVER SHANNON—MEELICK REACH.

- - - - - - - - Shannon Bridge.

in each Month of the following Years, before and after the Works, on which the Water it is lipping on the low Callows.

(in feet and inches) by the first line of figures.

For 19 Years after the Works.

The Water is lipping on Callows at *11 feet 7 inches on present Gauge.

Years.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Total.
						June.	July.	Aug.	Sept.				
1849 -	10·5 26	9·1 15	– –	– –	– –	– –	– –	– –	7·2 3	9·3 10	9·5 30	9·9 30	114
1850 -	8·7 18	9·10 28	7·3 4	6·9 3	– –	– –	– –	– –	– –	– –	8·7 12	7·11 26	91
1851 -	10·9 31	10·6 28	7·5 11	6·9 3	– –	– –	– –	– –	– –	– –	– –	– –	73
1852 -	10·8 23	12·5 29	7·7 5	– –	– –	6·11 2	7·0 5	– –	– –	– –	10·2 23	11·10 31	118
1853 -	13·0 31	9·10 16	6·4 2	6·9 3	– –	– –	– –	– –	– –	7·0 4	9·4 21	7·0 3	80
1854 -	10·0 22	9 11 18	– –	– –	– –	– –	– –	– –	– –	– –	– –	8·8 16	56
1855 -	7·6 6	– –	8·3 15	– –	– –	– –	– –	– –	– –	– –	– –	– –	21
1856 -	9·2 27	8·8 19	– –	– –	– –	– –	– –	– –	– –	– –	– –	9·0 20	66
1857 -	8·11 29	6·11 8	6·11 4	7·6 9	7·0 2	– –	– –	– –	– –	– –	– –	7·5 9	61
1858 -	7·5 9	7·1 6	– –	7·1 9	– –	– –	– –	– –	– –	– –	– –	9·7 19	43
1859 -	9·1 25	8·11 22	8·1 15	7·7 15	– –	– –	– –	– –	– –	– –	7·5 14	8·5 19	110
1860 -	10·3 31	10·1 20	7·5 25	7·3 11	– –	7·11 20	6·8 1	– –	– –	– –	– –	6·11 4	112
1861 -	6·11 2	7·7 8	8 7 29	7·9 10	– –	– –	– –	9·9 19	9·9 24	10·9 29	9·4 14	10·4 29	164
1862 -	9·11 18	10 3 17	7·8 11	7·7 11	7·2 5	– –	– –	– –	– –	8·7 12	9·3 27	9·5 25	126
1863 -	9·1 31	8·7 17	7·8 15	– –	– –	– –	– –	– –	– –	7·2 14	9·5 30	9·5 24	131
1864 -	6·8 1	7·9 10	6·10 3	– –	– –	– –	– –	– –	– –	– –	9·1 12	10·5 26	52
1865 -	7·9 12	8·1 27	7·9 13	– –	– –	– –	– –	– –	– –	– –	9·5 5	9·7 25	82
1866 -	10·7 31	9·4 28	7·1 4	– –	– –	– –	– –	– –	7·3½ 8	– –	7·2 10	9·3 30	111
1867 -	9·9 30	10·6 28	8·2 14	7·10 13	8·6 21	– –	– –	– –	– –	9·1 8	8·0 13	– –	127
Total -	403	344	170	87	28	22	6	19	35	77	211	336	1,738

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* The zero of the present Gauge is 4 feet 11 inches lower than the former gauge (which was on the Old Lock, Upper Sill). This 4 feet 11 inches has been deducted from the heights in this Table, to compare with the heights before the Works.

THE RIVER SHANNON—MEELICK REACH. - - - -

SHANNON BRIDGE. - - - - - - -

TABLE B.—Showing the Number of Days in each Month of the following Years, " before the undermentioned

When the Water is at 12 *feet* 2 *inches* on the present Gauge, *or* 7
When the Water is at 13 *feet* on the present Gauge, *or* 8 *feet* 1 *inch*
At 14 *feet* on the present Gauge, *or* 9 *feet* 1 *inch*

FOR 6$\frac{5}{12}$ YEARS BEFORE THE WORKS.

YEARS.	Heights of Water on Gauge.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
							June.	July.	Aug.	Sept.				
	Ft. in.													
1836	7 3	No Registry		31	30	16	–	2	13	29	31	30	31	213
	8 1			31	30	8	–	–	–	11	29	30	31	170
	9 1			15	16	–	–	–	–	–	18	30	31	110
1837	7 3	31	28	31	29	13	–	–	3	18	18	30	31	227
	8 1	31	28	31	2	–	–	–	–	4	–	28	31	155
	9 1	31	21	24	–	–	–	–	–	–	–	18	31	120
1838	7 3	31	28	31	30	17	–	–	23	30	9	30	31	260
	8 1	31	28	31	30	7	–	–	18	4	–	30	31	210
	9 1	26	27	31	16	–	–	–	–	–	–	24	31	155
1839	7 3	31	- Registry incomplete -					1	31	30	31	30	31	185
	8 1	31						–	12	30	31	30	31	165
	9 1	31						–	–	27	31	30	31	150
1840	7 3	31	29	29	–	–	–	18	29	30	8	23	31	223
	8 1	31	29	19	–	–	–	–	12	10	–	15	31	147
	9 1	31	29	10	–	–	–	–	–	–	–	9	17	96
1841	7 3	31	21	31	30	11	–	–	10	30	31	30	31	256
	8 1	26	21	31	16	–	–	–	–	26	30	30	31	211
	9 1	11	–	–	–	–	–	–	–	1	16	14	31	73
1842	7 3	31	28	31	27	–	–	–	–	–	–	18	31	166
	8 1	31	28	31	18	–	–	–	–	–	–	12	31	151
	9 1	31	28	31	11	–	–	–	–	–	–	8	19	128
TOTAL at -	7 3	186	134	184	146	57	–	16	109	162	128	191	217	1,530
TOTAL at -	8 1	181	134	174	96	15	–	–	42	85	90	175	217	1,209
TOTAL at -	9 1	161	105	111	43	–	–	–	–	28	65	128	191	832

REMARKS AS TO THE FLOODS FOR 6$\frac{5}{12}$ YEARS BEFORE THE WORKS.

1stly. The number of days on which the water was at and above 8 ft. 1 in. - = 1,209 days, or an average of 188·4 per year.
Ditto - - for *Seven Months (April to October*, both months inclusive) - - - - = 323 " " 50 "
Ditto - - for *Four Months (June, July, August, and September)* - = 127 " " 18·8 "
2ndly. The number of days on which the water was at and above 9 ft. 1 in., when ALL *the callows were flooded* = 832 " " 129·7 "
Ditto - - for *Seven Months (April to October*, both months inclusive) - - - - = 136 " " 20·7 "
Ditto - - for *Four Months (June, July, August, and September.)* = 28 " " 4·2 "

REMARKS AS TO THE FLOODS FOR 19 YEARS AFTER THE WORKS.

1stly. The number of days on which the water was at and above 13 ft. - - = 897 days, or an average of 47·2 per year.
Ditto - - for *Seven Months (April to October*, inclusive). = 64 " " 3·4 "
Ditto - - for *Four Months (June, July, August, and September)* - = 21 " " 1·1 "
2ndly. The number of days the water was at and above 14 ft., when ALL *the callows were flooded* - - - = 461 " " 24·3 "
Ditto - - for *Seven Months (April to October*, inclusive) - - = *33 " " 1·7 "
Ditto - - for *Four Months (June to September*, inclusive) - = †12 " " 0·6 "

* 29 *occurred in* 1861. † *All occurred in* 1861.

- - - - - THE RIVER SHANNON—MEELICK REACH.

- - - - - - - - SHANNON BRIDGE.

and after the Works," on which the Callows were flooded, when the Water was at and above Heights respectively,

feet 3 *inches on former Gauge*, the Water is flowing on the Callows.
on former Gauge, a considerable extent of the Callows are flooded.
on former Gauge, all the Callows are flooded.

FOR 19 YEARS AFTER THE WORKS.

YEARS.	Heights of Water on Gauge.		January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
								June.	July.	Aug.	Sept.				
	Ft.	*in.*													
1849	12	2	22	13	–	–	–	–	–	–	–	7	30	29	101
	13	0	18	8	–	–	–	–	–	–	–	7	30	24	87
	14	0	7	3	–	–	–	–	–	–	–	3	7	7	39
1850	12	2	13	28	1	–	–	–	–	–	–	–	11	17	70
	13	0	6	26	–	–	–	–	–	–	–	–	10	–	42
	14	0	–	11	–	–	–	–	–	–	–	–	–	–	11
1851	12	2	30	26	3	–	–	–	–	–	–	–	–	–	59
	13	0	22	22	–	–	–	–	–	–	–	–	–	–	44
	14	0	17	16	–	–	–	–	–	–	–	–	–	–	33
1852	12	2	21	29	2	–	–	–	–	–	–	–	23	31	106
	13	0	19	28	–	–	–	–	–	–	–	–	21	31	99
	14	0	11	25	–	–	–	–	–	–	–	–	15	21	72
1853	12	2	31	14	–	–	–	–	–	–	–	–	15	–	60
	13	0	31	11	–	–	–	–	–	–	–	–	9	–	51
	14	0	31	8	–	–	–	–	–	–	–	–	5	–	44
1854	12	2	21	15	–	–	–	–	–	–	–	–	–	15	51
	13	0	13	11	–	–	–	–	–	–	–	–	–	11	35
	14	0	6	5	–	–	–	–	–	–	–	–	–	–	11
1855	12	2	3	–	6	–	–	–	–	–	–	–	–	–	9
	13	0	–	–	3	–	–	–	–	–	–	–	–	–	3
	14	0	–	–	–	–	–	–	–	–	–	–	–	–	–
1856	12	2	17	13	–	–	–	–	–	–	–	–	–	14	44
	13	0	8	6	–	–	–	–	–	–	–	–	–	8	22
	14	0	8	–	–	–	–	–	–	–	–	–	–	–	8
1857	12	2	25	–	–	5	–	–	–	–	–	–	–	4	34
	13	0	20	–	–	–	–	–	–	–	–	–	–	–	20
	14	0	–	–	–	–	–	–	–	–	–	–	–	–	–
1858	12	2	2	–	–	–	–	–	–	–	–	–	–	18	20
	13	0	–	–	–	–	–	–	–	–	–	–	–	15	15
	14	0	–	–	–	–	–	–	–	–	–	–	–	7	7
1859	12	2	19	19	10	6	–	–	–	–	–	–	3	10	67
	13	0	13	14	2	–	–	–	–	–	–	–	–	2	31
	14	0	1	–	–	–	–	–	–	–	–	–	–	–	1
1860	12	2	31	16	10	4	–	14	–	–	–	–	–	–	75
	13	0	31	13	–	–	–	–	–	–	–	–	–	–	44
	14	0	22	8	–	–	–	–	–	–	–	–	–	–	30
1861	12	2	–	4	22	6	–	–	–	18	9	24	9	25	117
	13	0	–	–	5	–	–	–	–	16	5	21	7	24	78
	14	0	–	–	–	–	–	–	–	10	2	17	5	15	49
1862	12	2	17	15	6	6	–	–	–	–	–	11	24	24	103
	13	0	14	12	–	–	–	–	–	–	–	8	21	22	77
	14	0	11	9	–	–	–	–	–	–	–	–	4	6	30
1863	12	2	29	12	6	–	–	–	–	–	–	–	30	20	97
	13	0	16	6	–	–	–	–	–	–	–	–	28	17	67
	14	0	1	–	–	–	–	–	–	–	–	–	14	12	27
1864	12	2	–	6	–	–	–	–	–	–	–	–	10	24	40
	13	0	–	–	–	–	–	–	–	–	–	–	8	21	29
	14	0	–	–	–	–	–	–	–	–	–	–	1	18	19
1865	12	2	8	25	10	–	–	–	–	–	–	–	5	21	69
	13	0	–	3	–	–	–	–	–	–	–	–	3	16	22
	14	0	–	–	–	–	–	–	–	–	–	–	2	10	12
1866	12	2	31	26	–	–	–	–	–	–	1	–	–	30	88
	13	0	31	19	–	–	–	–	–	–	–	–	–	23	73
	14	0	27	7	–	–	–	–	–	–	–	–	–	12	46
1867	12	2	25	28	11	7	16	–	–	–	–	7	10	–	104
	13	0	15	27	3	–	4	–	–	–	–	3	6	–	58
	14	0	7	19	–	–	–	–	–	–	–	1	–	–	27
TOTAL at -	12	2	345	289	87	34	16	14	–	18	10	49	170	282	1,314
TOTAL at -	13	0	257	206	13	–	4	–	–	16	5	39	143	214	897
TOTAL at -	14	0	154	111	–	–	–	–	–	10	2	21	58	110	461

THE RIVER SHANNON—MEELICK REACH - - - - -

BANAGHER LOCK—UPPER SILL. - - - - - -

TABLE A.—Showing the Number of Days, with the greatest Height the Water attained in each Month above the Height when it is

The greatest Height the Water attained is shown

FOR $5\frac{1}{12}$ YEARS BEFORE THE WORKS.

The Water is lipping on the Callows at 7 feet 2 inches on former Gauge, Upper Sill, Old Lock.

YEARS.	January.	February.	March.	April.	May	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1836 -	–	No Registry	–	11·3 30	10·0 31	8·3 30	9·0 15	9·1 31	9·9 30	10·6 31	11·6 30	12·8 31	259
1837 -	11·0 31	12·9 28	12·5 31	9·4 30	9·3 31	9·3 30	8·6 31	8·6 31	9·8 30	9·4 31	11·8 30	11·2 31	365
1838 -	10·10 18*	10·5 10*	11·0 31	10·4 30	9·8 31	8·2 30	8·4 31	9·6 31	9·2 30	9·1 31	11·3 30	11·8 31	334
1839 -	–	–	No Registry for this year		–	–	–	–	–	–	–	–	–
1840 -	–	–	No Registry till July		–	–	9·0 19*	9·10 31	9·8 27	8·11 31	10·7 30	11·7 31	169
1841 -	10·4 31	11·2 28	10·2 31	9·10 30	9·3 31	8·0 30	8·3 31	9·1 31	10·2 30	10·11 31	11·0 30	11·11 31	365
1842 -	11·5 31	11·2 28	12·0 31	10·11 80	8·5 31	8·2 30	8·6 31	8·0 31	7·10 30	8·0 31	10·5 80	9·9 31	365
TOTALS -	111	94	124	150	155	150	158	186	177	186	180	186	1,857

* Registered only on these days.

- - - - - - THE RIVER SHANNON—MEELICK REACH.

- - - - - - - - BANAGHER LOCK—UPPER SILL.

of the following Years, before and after the Works respectively, on which the Water was at and lipping on the low Callows.

(in feet and inches) by the first line of figures.

FOR 7½ YEARS AFTER THE WORKS.

The Water is lipping on the Callows at *8 feet 11 inches on present Gauge.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	August.	Sept.				
1860 -	–	–	Not included		-	– {	8·1 8	7·6 9	7·6 2	7·5 13	7·10 12	8·7 23	67
1861 -	8·2 31	9·0 28	10·1 31	9·1 18	– –	– –	7·2 1	10·6 28	10·5 30	11·2 31	10·4 30	10·10 31	259
1862 -	10·9 31	10·11 28	9·1 31	9·1 30	8·9 17	7·10 12	– –	7·6 6	– –	9·7 17	10·4 30	10·6 31	233
1863 -	9·11 31	9·9 28	9·0 31	– –	7·7 7	– –	7·9 1	– –	– –	8·10 31	10·8 30	10·6 31	190
1884 -	8·5 31	9·1 25	8·8 22	7·2 1	– –	– –	– –	– –	– –	7·9 8	10·1 16	11·3 31	134
1865 -	9·6 31	9·6 28	9·4 31	7·8 11	7·2 1	7·2 1	– –	– –	– –	7·4 2	10·7 10	10·8 31	146
1866 -	11·1 31	10·3 28	8·5 31	8·2 17	– –	– –	– –	– –	8·8 16	7·10 18	8·8 30	10·6 31	202
1867 -	10·7 31	11·1 28	9·4 30	9·1 30	9·6 31	8·1 14	– –	– –	7·2 2	9·11 14	10·0 21	7·10 15	216
TOTALS -	217	193	207	107	58	27	10	43	50	134	179	224	1,447

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* The zero of the present Gauge is 1 foot 9 inches lower than the zero of the former Gauge of the Upper Sill, Old Lock. This 1 foot 9 inches has been deducted from the heights in this Table, to facilitate comparison with the heights before the works.

THE RIVER SHANNON—MEELICK REACH. - - - - - -

Banagher Lock—Upper Sill. - - - - - - -

Table B.—Showing the Number of Days in each Month of the following Years, "before and after the undermentioned

When the water is at 10 *feet on the present Gauge*, or 8 *feet* 3 *inches*
When the water is at 11 *feet on the present Gauge*, or 9 *feet* 3 *inches*
12 *feet* 3 *inches on present Gauge*, or 10 *feet* 6 *inches on former Gauge*,

For 5$\frac{1}{12}$ Years before the Works.

Years.	Heights of Water on Gauge.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	Total.
							June.	July.	Aug.	Sept.				
	ft. in.													
1836 -	8 3	No Registry.			30	31	3	3	15	28	31	30	31	202
	9 3				30	8	–	–	–	10	29	30	31	138
	10 6				19	–	–	–	–	–	3	19	31	72
1837 -	8 3	31	28	31	30	31	23	2	14	13	31	30	31	295
	9 3	31	28	31	9	1	1	–	–	3	1	30	31	166
	10 6	14	16	15	–	–	–	–	–	–	–	8	19	72
1838 -	8 3	18*	10*	31	30	24	–	7	29	30	20	30	31	260
	9 3	18	10	31	30	8	–	–	13	–	–	29	31	170
	10 6	3	–	16	–	–	–	–	–	–	–	17	13	49
1839 -	8 3 9 3 10 6	–	–	–	–	No Registry for this year.				–	–	–	–	–
1840 -	8 3	No Registry till July this year.					–	19*	31	27	24	30	31	162
	9 3							–	12	9	–	16	31	68
	10 6							–	–	–	–	2	9	11
1841 -	8 3	31	28	31	30	25	–	5	11	30	31	30	31	283
	9 3	31	28	31	19	1	–	–	–	25	31	30	31	227
	10 6	–	2	–	–	–	–	–	–	–	14	8	31	55
1842 -	8 3	31	28	31	30	7	–	15	–	–	–	19	31	192
	9 3	31	28	31	20	–	–	–	–	–	–	9	22	141
	10 6	25	16	31	7	–	–	–	–	–	–	–	–	79
Total at	8 3	111	94	124	150	118	26	51	100	128	137	169	186	1,394
Total at	9 3	111	94	124	108	18	1	–	25	47	61	144	177	910
Total at	10 6	42	34	62	26	–	–	–	–	–	17	54	103	338

Remarks as to the Floods for 5$\frac{1}{12}$ Years before the Works.

1stly. The number of days on which the water was at and above 9 ft. 3 in., = 910 days, or an average of 179· per year.
Ditto - ditto for *seven months (April to October*, both months inclusive), = 260 ditto - ditto - 47·3 ditto.
Ditto - ditto for *four months (June, July, August, and September*), = 73 ditto - ditto - 13· ditto.
2ndly. The number of days on which the water was at and above 10 ft 6 in., the height of the August flood of 1861, = 338 ditto - ditto - 66·5 ditto.
Ditto - ditto for *seven months (April to October*, both months inclusive), = 43 ditto - ditto - 7·8 ditto.
Ditto - ditto for *four months (June, July, August, and September*), = – ditto - ditto - – ditto.

Remarks as to the Floods for 7½ Years after the Works.

1stly. The number of days on which the water was at and above 11 ft, = 435 days, or an average of 58· per year.
Ditto - ditto for *seven months (April to October*, inclusive), = 57 ditto - ditto - 7·5 ditto.
Ditto - ditto for *four months (June, July, August, and September*), = †20 ditto - ditto - 2·6 ditto.
2ndly. The number of days the water was at and above 12 ft. 3 in., the height of the August flood of 1861, = 94 ditto - ditto - 12·5 ditto.
Ditto - ditto for *seven months (April to October*, inclusive), = †13 ditto - ditto - 1·7 ditto.
Ditto - ditto for *four months (June to September*, inclusive), = †2 ditto - ditto - 0·26 ditto.

Note.—The months marked thus (*), registry incomplete. † *All occurred in* 1861.

THE RIVER SHANNON—MEELICK REACH.

BANAGHER DOCK—UPPER SILL.

the Works," on which the callows were more or less flooded, when the Water was at and above heights respectively :—

on former Gauge, the Water is flowing on the callows.
on former Gauge, a considerable extent of the callows are flooded.
is the greatest height the Water attained *in the August flood of* 1861.

FOR 7½ YEARS AFTER THE WORKS.

YEARS.	Heights of Water on Gauge.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage. June.	July.	Aug.	Sept.	October.	November.	December.	TOTAL.
	ft. in.													
1860	10 0	–	–	Not included.			–	–	–	–	–	–	6	6
	11 0							–	–	–	–	–	–	–
	12 3							–	–	–	–	–	–	–
1861	10 0	–	9	31	10	–	–	–	19	16	28	13	28	154
	11 0	–	–	17	–	–	–	–	15	5	21	5	23	86
	12 3	–	–	–	–	–	–	–	2	–	11	–	5	18
1862	10 0	18	16	12	11	5	–	–	–	–	13	27	25	127
	11 0	14	12	–	–	–	–	–	–	–	8	21	22	77
	12 3	8	7	–	–	–	–	–	–	–	–	–	3	18
1863	10 0	31	16	14	–	–	–	–	–	–	14	30	24	129
	11 0	15	7	–	–	–	–	–	–	–	–	27	17	66
	12 3	–	–	–	–	–	–	–	–	–	–	3	1	4
1864	10 0	14	9	5	–	–	–	–	–	–	–	12	26	66
	11 0	–	–	–	–	–	–	–	–	–	–	9	21	30
	12 3	–	–	–	–	–	–	–	–	–	–	–	16	16
1865	10 0	14	28	13	–	–	–	–	–	–	–	6	27	88
	11 0	6	11	1	–	–	–	–	–	–	–	3	16	37
	12 3	–	–	–	–	–	–	–	–	–	–	1	2	3
1866	10 0	31	28	4	–	–	–	–	–	8	–	10	31	112
	11 0	31	20	–	–	–	–	–	–	–	–	–	26	77
	12 3	22	–	–	–	–	–	–	–	–	–	–	1	23
1867	10 0	30	28	15	16	22	–	–	–	–	8	11	–	130
	11 0	18	24	6	–	4	–	–	–	–	4	6	–	62
	12 3	2	10	–	–	–	–	–	–	–	–	–	–	12
Totals at	10 0	138	134	94	37	27	–	–	19	24	63	109	167	812
Totals at	11 0	84	74	24	–	4	–	–	15	5	33	71	125	435
Totals at	12 3	32	17	–	–	–	–	–	2	–	11	4	28	94

THE RIVER SHANNON—MEELICK REACH. - - - - -

HAMILTON LOCK—UPPER SILL. - - - - - - - -

TABLE A.—Showing the Number of Days, with the greatest height the Water attained, was at and above the height when

The greatest height the Water attained

FOR $6\frac{5}{12}$ YEARS BEFORE THE WORKS.

The Water is lipping on low callows at 7 feet 6 inches on present Gauge, Upper Sill.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1832 -	10·0 31	8·0 22	8·2 24	- -	- -	- -	- -	- -	- -	- -	9·0 26	- No Registry	103
1836 -	No Registry.		9·4 31	8·11 29	7·8 4	- -	7·7 2	7·8 6	8·3 19	9·11 30	9·7 30	10·5 31	182
1837 -	9·4 31	10·5 28	9·7 31	7·8 9	7·6 2	- -	- -	- -	7·11 12	7·9 1	9·10 30	9·6 31	175
1838 -	9·4 *15	9·1 *10	9·11 31	8·10 30	7·11 10	- -	- -	8·1 22	7·9 14	7·10 3	9·2 30	9·9 31	196
1839 -	9·3 *7	9·8 28	9·10 31	9·1 30	7·9 8	- -	7·8 1	8·2 30	9·9 *16	9·11 31	9·11 30	9·6 31	243
1840 -	10·7 31	11·0 29	9·1 24	- -	- -	7·6 3	7·8 11	8·5 16	8·2 17	- -	9·3 17	10·0 31	179
1841 -	9·2 31	9·1 28	8·8 31	8·3 24	7·8 7	- -	- -	7·8 6	8·7 28	9·5 31	9·6 30	10·1 31	247
TOTALS -	146	145	203	122	31	3	14	80	106	96	193	186	1,325

* Months during which the Registry was kept only for part of the Month.

- - - - - - THE RIVER SHANNON—MEELICK REACH.

- - - - - - - HAMILTON LOCK—UPPER SILL.

in each Month of the following Years, "before and after the Works," on which the Water it is lipping on the low callows.

is shown by the first line of figures.

FOR 17 YEARS AFTER THE WORKS.

The Water is lipping on low callows at 7 feet 6 inches on present Gauge, Upper Sill.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1847 -	8·11 25	9·6 28	8·4 11	– –	8·7 11	– –	– –	– –	– –	– –	9·5 22	10·11 31	128
1848 -	11·0 31	10·10 29	11·0 31	8·9 30	7·7½ 8	– –	– –	– –	– No Registry.	–	– –	– –	124
1852 -	– –	– –	– No Registry.	–	– –	– –	– –	– –	– –	– –	8·10 19	10·0 31	50
1853 -	11·1 81	9·4 19	– –	7·8 6	– –	– –	– –	– –	– –	– –	7·11 17	7·9 12	85
1854 -	10·2 23	10·4 28	7·10 11	– –	– –	– –	7·8 4	– –	– –	– –	– –	9·5 23	89
1855 -	8·11 17	8·2 3	9·3 30	– –	– –	– –	– –	– –	– –	8·0 5	8·0 17	7·10 2	74
1856 -	9·10 81	9·6 29	7·10 5	– –	– –	– –	– –	– –	8·2 2	7·9 6	– –	9·9 24	97
1857 -	10·2 81	8·5 28	8·5 23	8·9 28	8·3 11	– –	– –	– –	– –	– –	8·1 8	8·8 15	144
1858 -	8·9 24	8·6 26	8·3 22	8·8 25	7·11 11	– –	– –	– –	– –	– –	– –	10·2 28	186
1859 -	9·6 31	9·6 22	8·7 19	8·2 18	7·6 2	– –	– –	– –	– –	7·6 5	8·7 29	9·5 31	157
1860 -	11·1 31	10·11 29	8·8 31	8·7 19	– –	8·9 24	8·5 7	7·9 14	7·7 5	7·9 12	7·10 7	8·5 21	200
1861 -	8·2 31	9·0 27	9·7 31	8·10 17	– –	– –	– –	9·10 28	9·9 30	10·5 81	9·10 80	10·3 31	256
1862 -	10·2 29	10·7 28	9·0 27	9·0 30	8·8 15	7·11 10	– –	7·7 2	– –	9·4 16	9·10 80	10·2 31	218
1863 -	9·9 31	9·4 27	8·11 29	– –	7·8 5	– –	– –	– –	– –	8·7 30	10·3 30	10·0 31	183
1864 -	8·4 31	8·11 23	8·7 19	– –	– –	– –	– –	– –	– –	7·10 7	9·8 16	10·10 31	127
1865 -	9·4 28	9·4 28	9·1 29	7·10 9	– –	– –	– –	– –	– –	8·6 2	10·6 21	10·6 31	148
1866 -	10·11½ 81	10·3 28	8·11 31	8·7 26	– –	– –	– –	– –	8·5 12	7·10 12	8·4 25	9·10 31	196
1867 -	10·2 31	10·7 28	9·1 25	8·10 30	9·4 31	8·1 13	– –	– –	– –	9·6 13	9·7 18	7·11 14	208
TOTALS -	487	480	374	238	89	47	11	44	49	139	289	418	2,615

NOTE.—The zero of this Gauge when reset in 1852, was placed 6 inches lower than top of Sill, and remained so until 12th July 1860, when it was correctly set. This error in the registered heights, for the period named, has been rectified by 6 inches being deducted therefrom.

THE RIVER SHANNON—MEELICK REACH. - - - - - -

HAMILTON LOCK—UPPER SILL. - - - - - - - -

TABLE B.—Table showing the Number of Days in each Month of the following Years, and above the following

When the water is at 8 feet 2 inches on Gauge a considerable portion
When the water is at 9 feet on Gauge all the callows between

FOR $6\frac{5}{12}$ YEARS BEFORE THE WORKS.

YEARS.	Heights of Water on present Gauge.		January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTALS.
	ft.	*in.*						June.	July.	August.	Sept.				
1832 -	8	2	26	–	2	–	–	–	–	–	–	–	10	No Registry.	38
	9	0	15	–	–	–	–	–	–	–	–	–	2		17
1836 -	8	2	No Registry.		31	20	–	–	–	–	2	21	30	31	135
	9	0			4	–	–	–	–	–	–	6	20	31	61
1837 -	8	2	31	28	24	–	–	–	–	–	–	–	29	31	143
	9	0	19	18	12	–	–	–	–	–	–	–	8	18	75
1838 -	8	2	15*	10*	31	27	–	–	–	–	–	–	27	31	141
	9	0	8	4	18	–	–	–	–	–	–	–	7	19	56
1839 -	8	2	7*	28	31	25	–	–	–	4	15*	31	30	31	202
	9	0	7	28	9	2	–	–	–	–	10	31	30	10	127
1840 -	8	2	31	29	14	–	–	–	–	6	2	–	14	27	123
	9	0	31	29	4	–	–	–	–	–	–	–	5	11	80
1841 -	8	2	21	24	17	8	–	–	–	–	13	25	26	31	165
	9	0	3	1	–	–	–	–	–	–	–	12	8	31	55
Total at	8	2	131	119	150	80	–	–	–	10	32	77	166	182	947
Total at	9	0	83	80	47	2	–	–	–	–	10	49	80	120	471

REMARKS AS TO THE FLOODS FOR $6\frac{5}{12}$ YEARS BEFORE THE WORKS.

1stly. The number of days on which the water was at and above 8 ft. 2 in. = 947 days, or an average of 147·6 per year.
Ditto - ditto - for the four months of June, July, August, and September, = 42 ditto - ditto - 6· ditto.
2ndly. *The number of days when all the callows were flooded* - = 471 ditto - ditto - 73·4 ditto.
Ditto - ditto - *for the four months of June, July, August, and September,* = 10 ditto - ditto - 1·5 ditto.

REMARKS AS TO THE FLOODS FOR 17 YEARS AFTER THE WORKS.

1stly. The number of days on which the water was at and above 8 ft. 2 in., = 1,626 days, or an average of 95·6 per year.
Ditto - ditto - for the four months of June, July, August, and September, = †63 ditto - ditto - 3·7 ditto.
2ndly. *The number of days when all the callows were flooded* - = 831 ditto - ditto - 49· ditto.
Ditto - ditto - *for the four months of June, July, August, and September,* = ‡20 ditto - ditto - 1·2 ditto.

* Registry incomplete for those months. † Twenty days of this occurred in 1860, and 35 days in 1861.
‡ All occurred in 1861.

- - - - - THE RIVER SHANNON—MEELICK REACH.

- - - - - - - HAMILTON LOCK—UPPER SILL.

"before and after the Works" on which the callows were flooded when the water was at heights respectively :—

of the low callows are flooded between this Lock and Banagher.
this Lock and Banagher are flooded—Silk's Island excepted.

FOR 17 YEARS AFTER THE WORKS.

YEARS.	Heights of Water on present Gauge.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTALS.
							June.	July.	August.	Sept.				
	ft. in.													
1847 -	8 2	8	23	3	–	5	–	–	–	–	–	12	31	82
	9 0	–	9	–	–	–	–	–	–	–	–	5	31	45
1848 -	8 2	31	25	31	18	–	–	–	–	No Registry.			–	105
	9 0	94	22	29	–	–	–	–						75
1852 -	8 2	–	–	No Registry.			–	–	–	–	–	2	31	33
	9 0								–	–	–	–	31	31
1853 -	8 2	31	13	–	–	–	–	–	–	–	–	–	–	44
	9 0	31	7	–	–	–	–	–	–	–	–	–	–	38
1854 -	8 2	21	23	–	–	–	–	–	–	–	–	–	16	60
	9 0	15	13	–	–	–	–	–	–	–	–	–	14	42
1855 -	8 2	7	–	20	–	–	–	–	–	–	–	–	–	27
	9 0	–	–	4	–	–	–	–	–	–	–	–	–	4
1856 -	8 2	30	21	–	–	–	–	–	–	1	–	–	20	72
	9 0	10	7	–	–	–	–	–	–	–	–	–	10	27
1857 -	8 2	29	20	7	10	3	–	–	–	–	–	–	10	79
	9 0	23	–	–	–	–	–	–	–	–	–	–	–	23
1858 -	8 2	9	11	2	13	–	–	–	–	–	–	–	19	54
	9 0	–	–	–	–	–	–	–	–	–	–	–	15	15
1859 -	8 2	25	17	10	1	–	–	–	–	–	–	15	25	93
	9 0	15	10	–	–	–	–	–	–	–	–	–	3	28
1860 -	8 2	31	21	17	6	–	14	6	–	–	–	–	6	101
	9 0	31	13	–	–	–	–	–	–	–	–	–	–	44
1861 -	8 2	2	14	31	12	–	–	–	19	16	28	15	29	166
	9 0	–	1	19	–	–	–	–	15	5	20	5	24	89
1862 -	8 2	19	19	16	19	7	–	–	–	–	12	28	25	145
	9 0	14	12	2	2	–	–	–	–	–	8	19	22	79
1863 -	8 2	31	16	16	–	–	–	–	–	–	18	30	24	135
	9 0	16	8	–	–	–	–	–	–	–	–	28	18	70
1864	8 2	18	10	8	–	–	–	–	–	–	–	12	27	75
	9 0	–	–	–	–	–	–	–	–	–	–	9	23	32
1865 -	8 2	14	28	15	–	–	–	–	–	–	–	10	31	98
	9 0	5	16	3	–	–	–	–	–	–	–	5	18	47
1866 -	8 2	31	28	19	6	–	–	–	–	7	–	8	30	129
	9 0	31	26	–	–	–	–	–	–	–	–	–	23	80
1867 -	8 2	28	28	16	14	23	–	–	–	–	8	11	–	128
	9 0	16	24	8	–	4	–	–	–	–	4	6	–	62
Total at	8 2	365	317	211	99	38	14	6	19	24	66	143	324	1,626
Total at	9 0	231	168	65	2	4	–	–	15	5	32	77	232	831

THE RIVER SHANNON—LOUGH DERG REACH. - - - - -

KILLALOE LOCK—UPPER SILL. - - - - - -

TABLE A.—Showing the Number of Days in each Month of the following Years, "before and
The greatest height the water attained

NOTE.—The heights "after the Works" have been corrected approximately, by additions thereto, for the fall in the embankment which formerly separated the Canal

FOR 6⅚ YEARS BEFORE THE WORKS.

The water was lipping on low eallows at 9 feet 1 inch on present Gauge.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June	July.	August.	Sept.				
1832 -	14·4 31	11·1 *25	10·8 31	10·1 30	9·6 16	– –	– –	– –	– –	– †–	12·0 28	– No Registry	161
1836 -	– No Registry.	12·8 29	12·9 31	12·5 30	10·7 26	– –	– –	9·5 14	10·7 27	11·11 31	13·0 30	14·4 31	249
1837 -	12·11 31	14·1 28	13·10 31	10·6 30	10·1 31	9·3 6	– –	– –	9·6 12	9·8 29	12·9 30	12·9 31	259
1838 -	12·4 31	12·0 28	12·6 31	12·0 30	10·9 30	– –	– –	10·6 25	10 2 30	10·3 22	12·9 30	13 3 31	288
1839 -	13·0 31	13·6 2	13·4 31	11·9 30	10·9 28	– –	9·4 2	10·4 31	12·11 30	13·3 31	13·2 30	12·8 31	303
1840 -	14·7 31	15·3 29	12·10 31	9·8 13	– –	– –	9·7 12	10·7 31	10·7 30	9·9 17	11·9 27	12·9 31	252
1841 -	11·6 31	11·6 28	11 5 31	11·2 30	10·3 30	– –	– –	9·11 24	10·9 30	12·2 31	11·8 30	12·9 31	296
TOTALS -	186	195	217	193	161	6	14	125	159	161	205	186	1,808

* Gauge resetting four last days.

† Only 16 days registered.

THE RIVER SHANNON—LOUGH DERG REACH.

KILLALOE LOCK—UPPER SILL.

after the Works," on which the water was at and above the height when it is lipping on the low callows. is shown by the first line of figures.

surface of the water between the pier head and present Gauge, Upper Sill, consequent on the removal of the approaching the Lock from the river course near the weir.

FOR 21 YEARS AFTER THE WORKS.

The water is lipping on low callows at 8 feet 7 inches on present Gauge.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	August.	Sept.				
1847 -	10·8 31	11·0 28	10·5 15	– –	10·5 18	9·10 7	– –	– –	– –	– –	9·10 14	11·0 31	144
1848 -	11·3 31	10·9 25	11·3 31	9·8 18	– –	– –	– –	9·8 9	9·3 2	– –	– –	10·6 28	144
1849 -	10·7 26	10·5 17	– –	– –	– –	– –	– –	– –	– –	9·10 6	10·2 30	10·3 31	110
1850 -	10·0 15	10·8 28	9·8 6	– –	– –	– –	– –	– –	– –	– –	10·2 11	9·10 26	86
1851 -	11·0 31	10·11 28	9·4 9	9·6 7	– –	– –	– –	– –	– –	– –	– –	– –	75
1852 -	10·11 20	12·1 29	9·10 7	– –	– –	– –	– –	– –	– –	– –	10·6 22	11·2 31	109
1853 -	12·0 31	10·8 21	– –	– –	– –	– –	– –	– –	– –	9·3 2	10·3 22	9·2 5	81
1854 -	10·6 18	10·8 20	– –	– –	– –	– –	– –	– –	– –	– –	– –	10·0 16	54
1855 -	9·6 7	– –	9·8 23	– –	– –	– –	– –	– –	– –	– –	– –	– –	30
1856 -	10·2 28	10·0 19	– –	– –	– –	– –	– –	– –	– –	– –	– –	10·5 17	64
1857 -	10·0 29	– –	– –	9·6 6	9·3 4	– –	– –	– –	– –	– –	– –	9·3 8	47
1858 -	9·3 8	9·6 10	– –	9·6 10	– –	– –	– –	– –	– –	– –	– –	10·5 19	47
1859 -	10·3 24	10·2 23	10·0 16	9·6 18	– –	– –	– –	– –	– –	– –	9·1 6	9·10 24	111
1860 -	11·0 31	11·0 21	9·3 23	9·3 7	– –	9·6 18	9·1 2	– –	– –	– –	– –	9·1 5	107
1861 -	– –	9·6 10	10·2 31	9·10 14	– –	– –	– –	10·3 17	10·2 18	10·8 31	10·2 11	10·6 30	162
1862 -	10·6 15	10·9 21	9·8 15	9·10 18	9·4 10	– –	– –	– –	– –	10·0 12	10·2 29	10·5 25	145
1863 -	10·2 31	10·0 19	9·11 18	– –	– –	– –	– –	– –	– –	9·4 16	10·8 30	10·6 24	138
1864 -	9·2 9	9·4 9	9·2 4	– –	– –	– –	– –	– –	– –	– –	10·2 9	10·9 27	58
1865 -	9·10 14	10·0 28	9·9 14	– –	– –	– –	– –	– –	– –	– –	10·5 5	10·5 23	84
1866 -	11·2 31	10·6 28	9·5 8	9·3 2	– –	– –	– –	– –	– –	– –	9·2 6	10·5 30	105
1867 -	10·4 30	11·1 28	9·8 15	9·5 71	9·10 24	9·1 2	– –	– –	– –	9·11 8	10·0 13	– –	137
Totals -	460	412	235	117	56	27	2	26	20	75	208	400	2,038

THE RIVER SHANNON—LOUGH DERG REACH. - - - - -

KILLALOE LOCK—UPPER SILL. - - - - - - - -

TABLE B.—Table showing the Number of Days in each Month of the following Years, before and after the respectively. When the Water is at 8 feet 10 inches on present Gauge (or

When the Water is *at 9 feet on present Gauge* (*or* 10 *feet* before the Works *on same Gauge*) *all the low* Works *on same Gauge*) *all*

FOR 6$\frac{5}{6}$ YEARS BEFORE THE WORKS.

YEARS.	Heights of Water on Gauge.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTALS.
							June.	July.	Aug	Sept.				
1832 - -	9 8	31	25	31	9	–	–	–	–	–	–	26	No Registry	122
	10 0	31	25	25	1	–	–	–	–	–	–	19		101
	10 2	31	23	25	–	–	–	–	–	–	–	15		94
1836 - -	9 8	No Registry	29	31	30	15	–	–	–	25	31	30	31	222
	10 0		29	31	30	9	–	–	–	18	30	30	31	208
	10 2		29	31	30	8	–	–	–	12	24	30	31	195
1837 - -	9 8	31	28	31	22	20	–	–	–	–	1	30	31	194
	10 0	31	28	31	16	4	–	–	–	–	–	30	31	171
	10 2	31	28	31	10	–	–	–	–	–	–	29	31	160
1838 - -	9 8	31	28	31	30	22	–	–	21	19	5	30	31	248
	10 0	31	28	31	30	15	–	–	19	12	3	30	31	230
	10 2	31	28	31	30	13	–	–	17	3	2	30	31	216
1839 - -	9 8	31	28	31	30	16	–	–	29	30	31	30	31	287
	10 0	31	28	31	30	13	–	–	25	30	31	30	31	280
	10 2	31	28	31	30	9	–	–	22	30	31	30	31	273
1840 - -	9 8	31	29	31	1	–	–	–	13	29	4	18	31	187
	10 0	31	29	29	–	–	–	–	12	19	–	14	31	165
	10 2	31	29	26	–	–	–	–	11	15	–	14	31	157
1841 - -	9 8	31	28	31	29	16	–	–	6	30	31	30	31	263
	10 0	31	28	31	28	9	–	–	–	29	31	30	31	243
	10 2	31	27	31	25	2	–	–	–	26	31	30	31	234
Total at - -	9 8	186	195	217	151	89	–	–	69	133	103	194	186	1,523
Total at - -	10 0	186	195	209	135	50	–	–	56	108	95	183	186	1,403
Total at - -	10 2	186	192	206	123	32	–	–	50	86	88	178	186	1,849

REMARKS AS TO FLOODS FOR 6$\frac{5}{6}$ YEARS BEFORE THE WORKS.

1stly. The number of days on which the water was at and above 10 ft. 0 in. on Gauge - - - } = 1,403 days, or an average of 205·4 per year.

Ditto - ditto - for the four months, June, July, August, and September - } = 164 ditto - - ditto - 23·4 ditto.

2ndly. The *total number of days when all the callows were flooded* - = 1,349 ditto - - ditto - 197·5 ditto.

Ditto - ditto - - - *for the four months, June, July, August, and September* - } = 136 ditto - - ditto - 19·4 ditto.

REMARKS AS TO FLOODS FOR 21 YEARS AFTER THE WORKS.

1stly. The number of days on which the water was at and above 9 ft. 0 in. - - - - - } = 886 days, or an average of 42·2 per year.

Ditto - ditto - for the four months, June, July, August, and September - - - } = * 11 ditto - - ditto - 0·5 ditto.

2ndly. The *number of days when all the callous were flooded* - - = 710 ditto - - ditto - 33·8 ditto.

Ditto - ditto - *for the four months, June, July, August, and September* - - - } = * 8 ditto - - ditto - 0·4 ditto.

* Those Floods occurred in 1861.

THE RIVER SHANNON—LOUGH DERG REACH.

KILLALOE LOCK—UPPER SILL.

Works, on which the Callows were flooded, when the Water was at and above the undermentioned Heights 9 feet 8 inches before the Works on same Gauge), the low Callows are partly flooded.

Callows are flooded. When the Water is *at 9 feet 1 inch on present Gauge* (*or 10 feet 2 inches* before the *the Callows are flooded.*

FOR 21 YEARS AFTER THE WORKS.

YEARS.	Heights of Water on Gauge.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTALS.
							June.	July.	Aug.	Sept.				
1847 - -	8 10	14	28	9	–	14	2	–	–	–	–	4	31	102
	9 0	7	27	6	–	10	–	–	–	–	–	–	30	80
	9 1	6	26	4	–	8	–	–	–	–	–	–	26	70
1848 - -	8 10	26	21	31	1	–	–	–	2	–	–	–	21	102
	9 0	23	20	29	–	–	–	–	–	–	–	–	17	89
	9 1	20	18	28	–	–	–	–	–	–	–	–	14	80
1849 - -	8 10	18	12	–	–	–	–	–	–	–	4	30	28	92
	9 0	16	9	–	–	–	–	–	–	–	–	11	18	54
	9 1	16	8	–	–	–	–	–	–	–	–	1	15	40
1850 - -	8 10	5	28	1	–	–	–	–	–	–	–	9	9	52
	9 0	2	26	–	–	–	–	–	–	–	–	6	–	34
	9 1	–	24	–	–	–	–	–	–	–	–	3	–	27
1851 - -	8 10	23	25	–	–	–	–	–	–	–	–	–	–	48
	9 0	16	21	–	–	–	–	–	–	–	–	–	–	37
	9 1	15	19	–	–	–	–	–	–	–	–	–	–	34
1852 - -	8 10	16	29	2	–	–	–	–	–	–	–	21	31	99
	9 0	12	28	–	–	–	–	–	–	–	–	19	31	90
	9 1	11	27	–	–	–	–	–	–	–	–	19	30	87
1853 - -	8 10	31	15	–	–	–	–	–	–	–	–	14	–	60
	9 0	31	12	–	–	–	–	–	–	–	–	10	–	53
	9 1	31	11	–	–	–	–	–	–	–	–	8	–	50
1854 - -	8 10	9	14	–	–	–	–	–	–	–	–	–	11	34
	9 0	7	12	–	–	–	–	–	–	–	–	–	6	25
	9 1	6	9	–	–	–	–	–	–	–	–	–	–	15
1855 - -	8 10	–	–	6	–	–	–	–	–	–	–	–	–	6
	9 0	–	–	–	–	–	–	–	–	–	–	–	–	–
	9 1	–	–	–	–	–	–	–	–	–	–	–	–	–
1856 - -	8 10	9	7	–	–	–	–	–	–	–	–	–	10	26
	9 0	7	2	–	–	–	–	–	–	–	–	–	7	16
	9 1	5	–	–	–	–	–	–	–	–	–	–	5	10
1857 - -	8 10	19	–	–	–	–	–	–	–	–	–	–	–	19
	9 0	10	–	–	–	–	–	–	–	–	–	–	–	10
	9 1	–	–	–	–	–	–	–	–	–	–	–	–	–
1858 - -	8 10	–	–	–	–	–	–	–	–	–	–	–	11	11
	9 0	–	–	–	–	–	–	–	–	–	–	–	8	8
	9 1	–	–	–	–	–	–	–	–	–	–	–	5	5
1859 - -	8 10	15	18	9	–	–	–	–	–	–	–	–	2	44
	9 0	10	13	1	–	–	–	–	–	–	–	–	–	24
	9 1	5	1	–	–	–	–	–	–	–	–	–	–	6
1860 - -	8 10	31	17	–	–	–	1	–	–	–	–	–	–	49
	9 0	30	13	–	–	–	–	–	–	–	–	–	–	43
	9 1	29	12	–	–	–	–	–	–	–	–	–	–	41
1861 - -	8 10	–	–	27	7	–	–	–	14	3	27	5	26	109
	9 0	–	–	11	–	–	–	–	10	1	22	5	24	73
	9 1	–	–	2	–	–	–	–	7	1	19	1	20	50
1862 - -	8 10	13	15	4	6	–	–	–	–	–	9	23	21	91
	9 0	13	12	–	–	–	–	–	–	–	1	10	13	49
	9 1	11	10	–	–	–	–	–	–	–	–	4	9	34
1863 - -	8 10	25	12	6	–	–	–	–	–	–	–	29	19	91
	9 0	10	6	–	–	–	–	–	–	–	–	24	17	57
	9 1	5	–	–	–	–	–	–	–	–	–	19	16	40
1864 - -	8 10	–	–	–	–	–	–	–	–	–	–	6	24	30
	9 0	–	–	–	–	–	–	–	–	–	–	3	21	24
	9 1	–	–	–	–	–	–	–	–	–	–	1	20	21
1865 - -	8 10	7	17	5	–	–	–	–	–	–	–	3	17	49
	9 0	–	1	–	–	–	–	–	–	–	–	3	14	18
	9 1	–	–	–	–	–	–	–	–	–	–	2	12	14
1866 - -	8 10	31	24	–	–	–	–	–	–	–	–	–	27	82
	9 0	29	18	–	–	–	–	–	–	–	–	–	19	66
	9 1	29	16	–	–	–	–	–	–	–	–	–	16	61
1867 - -	8 10	16	28	8	–	7	–	–	–	–	3	7	–	69
	9 0	8	23	–	–	–	–	–	–	–	1	4	–	36
	9 1	3	22	–	–	–	–	–	–	–	–	–	–	25
Total at - -	8 10	308	310	108	14	21	3	–	16	3	43	151	288	1,265
Total at - -	9 0	231	243	47	–	10	–	–	10	1	24	95	225	886
Total at - -	9 1	192	203	34	–	8	–	–	7	1	19	58	188	710

THE RIVER SHANNON.—ERRINA LOCK.—UPPER SILL. - - - -

TABLE A.—Showing the Number of Days in each Month of the following Years on which the Water was

The greatest Height the Water attained is shown

FOR $6\frac{17}{24}$ YEARS BEFORE THE WORKS.

YEARS.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
						June.	July.	Aug.	Sept.				
1832 -	12·11 23	– –	– –	– –	– –	– –	– –	– –	– –	– –	10·6 2	– No Registry.	25
1836 -	– No Registry.	11·3½ 8*	12·1 31	11·10 30	10·0 1	– –	– –	– –	– –	11·5 19	12·6½ 30	14·0½ 31	150
1837 -	12·5 31	13·10 28	13·6 31	– –	– –	– –	– –	– –	– –	– –	12·3¾ 28	12·3 31	149
1838 -	12·0 31	11·7 28	12·0 31	11·4 30	10·1 4	– –	– –	10·10 21	10·8 16	– –	11·11 29	13·0 31	221
1839 -	12·10 31	13·2 28	12·9 31	11·7 30	10·3 5	– –	– –	10·0 1	12·7 29	13·0 31	12·11 30	12·3 31	247
1840 -	14·7 31	15·2 29	12·7 24	– –*	– –*	– –	– –	– –	– –	– –	10·5 9	11·8 22	115
1841 -	10·2 9	10·3 9	10·2 8	– –	– –	– –	– –	– –	– –	11·9 15	11·2 16	12·4 31	88
Totals -	156	130	156	90	10	–	–	22	45	65	144	177	995

For the months marked thus (*), the registry is incomplete.

- - - - - THE RIVER SHANNON.—ERRINA LOCK.—UPPER SILL.

at and above 10 feet on the Gauge, 10 feet being the height at which the Water is lipping on the low Callows.
(in feet and inches) by the first line of figures.

Years.	For 20 Years after the Works.												
						Months in which Floods do the greatest Damage.							
	January.	February.	March.	April.	May.	June.	July.	Aug.	Sept.	October.	November.	December.	Total.
1848 -	13·4½ 28	13·0 24	13·0 31	10·3½ 10	– –	– –	– –	10·6 8	– –	– –	– –	12·0 27	128
1849 -	12·1 18	11·10 14	– –	– –	– –	– –	– –	– –	– –	10·7 5	10·11 30	11·6 30	97
1850 -	11·1 9	12·7 28	10·6 3	– –	– –	– –	– –	– –	– –	– –	11·3 11	10·7 16	67
1851 -	13·0 30	12·7 26	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	56
1852 -	12 10 17	14·6 29	10·8 2	– –	– –	– –	– –	– –	– –	– –	12·2 21	13·0 31	100
1853 -	14·7 31	12·4 16	– –	– –	– –	– –	– –	– –	– –	– –	11·6 16	– –	63
1854 -	12·0 15	12·1 16	– –	– –	– –	– –	– –	– –	– –	– –	– –	10·10 13	44
1855 -	10·4 4	– –	10·6 8	– –	– –	– –	– –	– –	– –	– –	– –	– –	12
1856 -	11·6 25	10·9 12	– –	– –	– –	– –	– –	– –	– –	– –	– –	11·5 16	53
1857 -	11·0 26	– –	– –	10·0 1	– –	– –	– –	– –	– –	– –	– –	– –	27
1858 -	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –	11·9 18	18
1859 -	11·8 19	11·3 20	10·10 12	10·0 1	– –	– –	– –	– –	– –	– –	– –	10·9 13	65
1860 -	13·3 31	13·3 18	10·1 6	10·0 1	– –	10·3 11	– –	– –	– –	– –	– –	– –	67
1861 -	– –	10·0 4	11·0 29	10·7 11	– –	– –	– –	11·7 18	11·7 5	12·0 28	11·1 6	11·11 27	128
1862 -	12·3 13	12·5 16	10·6 7	10·6 10	– –	– –	– –	– –	– –	10·11 11	11·2 25	11·8 23	105
1863 -	11·2 31	11·0 15	10·6 10	– –	– –	– –	– –	– –	– –	10·1 3	12·4 30	11·11 22	111
1864 -	– –	10·0 4	– –	– –	– –	– –	– –	– –	– –	– –	11·3 8	12 8 26	38
1865 -	10·9 10	10·10 28	10·6 10	– –	– –	– –	– –	– –	– –	– –	11·6 4	12·0 20	72
1866 -	12 9½ 31	11·10 28	10·1 1	– –	– –	– –	– –	– –	– –	– –	– –	11·10 29	89
1867 -	11·5 22	12·10 28	10·6 13	10·3½ 5	10·9 15	– –	– –	– –	– –	10·10½ 7	11·2 10	– –	100
Totals -	360	326	132	39	15	11	–	26	5	54	161	311	1,440

THE RIVER SHANNON—ERRINA LOCK—UPPER SILL. - - - -

TABLE B.—Showing the Number of Days in each Month of the following Years,
11 feet 7 inches on the Gauge is the greatest Height

FOR $6\frac{17}{24}$ YEARS BEFORE THE WORKS.

YEARS.	Height of Water.		January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
								June.	July.	Aug.	Sept.				
	Ft.	*in.*													
1832 -	11	7	8	–	–	–	–	–	–	–	–	–	–	–	8
1836 -	11	7	No registry.	–	14	5	–	–	–	–	–	–	17	31	67
1837 -	11	7	24	16	16	–	–	–	–	–	–	–	7	20	83
1838 -	11	7	24	4	13	–	–	–	–	–	–	–	11	21	73
1839 -	11	7	31	28	18	3	–	–	–	–	18	31	31	17	177
1840 -	11	7	31	29	8	–	–	–	–	–	–	–	–	3	71
1841 -	11	7	–	–	–	–	–	–	–	–	–	5	–	20	25
Totals at	11	7	118	77	69	8	–	–	–	–	18	36	66	112	504

REMARKS AS TO THE FLOODS FOR $6\frac{17}{24}$ YEARS BEFORE THE WORKS.

The number of days the water was at and above 11 ft. 7 in., or the height of the August flood of 1861 - - } = 504 days, or an average of 75·1 per year.
Ditto - - for the seven months, April to October, inclusive - - - - - - - - } = 62 - ditto - ditto - 8·9 ditto.
Ditto - - for the four months, June to September, inclusive - - - - - - - - } = 18 - ditto - ditto - 2·6 ditto.

REMARKS AS TO THE FLOODS FOR 20 YEARS AFTER THE WORKS.

The number of days the water was at and above 11 ft. 7 in. - - = 414 days, or an average of 20·7 per year.
Ditto - - for the seven months, April to October, inclusive - - - - - - - - } = *16 - ditto - ditto - 0·8 ditto.
Ditto - - for the four months, June to September, inclusive - - - - - - - - } = *2 - ditto - ditto - 0·1 ditto.

* Occurred in 1861.

THE RIVER SHANNON.—ERRINA LOCK.—UPPER SILL.

" before and after the Works," on which the Callows were more or less flooded.
the Water attained in the August flood of 1861.

FOR 20 YEARS AFTER THE WORKS.

YEARS.	Height of Water.	January.	February.	March.	April.	May.	Months in which Floods do the greatest Damage.				October.	November.	December.	TOTAL.
							June.	July.	Aug.	Sept.				
	Ft. in.													
1848 -	11 7	16	7	20	–	–	–	–	–	–	–	–	9	52
1849 -	11 7	11	4	–	–	–	–	–	–	–	–	–	–	15
1850 -	11 7	–	12	–	–	–	–	–	–	–	–	–	–	12
1851 -	11 7	15	15	–	–	–	–	–	–	–	–	–	–	30
1852 -	11 7	9	25	–	–	–	–	–	–	–	–	15	24	73
1853 -	11 7	31	8	–	–	–	–	–	–	–	–	–	–	39
1854 -	11 7	2	4	–	–	–	–	–	–	–	–	–	–	6
1855 -	11 7	–	–	–	–	–	–	–	–	–	–	–	–	–
1856 -	11 7	–	–	–	–	–	–	–	–	–	–	–	–	–
1857 -	11 7	–	–	–	–	–	–	–	–	–	–	–	–	–
1858 -	11 7	–	–	–	–	–	–	–	–	–	–	–	5	5
1859 -	11 7	2	–	–	–	–	–	–	–	–	–	–	–	2
1860 -	11 7	23	10	–	–	–	–	–	–	–	–	–	–	33
1861 -	11 7	–	–	–	–	–	–	–	1	1	14	–	7	23
1862 -	11 7	9	8	–	–	–	–	–	–	–	–	–	3	20
1863 -	11 7	–	–	–	–	–	–	–	–	–	–	14	11	25
1864 -	11 7	–	–	–	–	–	–	–	–	–	–	–	19	19
1865 -	11 7	–	–	–	–	–	–	–	–	–	–	–	6	6
1866 -	11 7	25	5	–	–	–	–	–	–	–	–	–	5	35
1867 -	11 7	–	19	–	–	–	–	–	–	–	–	–	–	19
Total at	11 7	143	117	20	–	–	–	–	1	1	14	29	89	414

Office Public Works, Dublin,
23 March 1868.

James S. Penny.

Appendix, No. 2.

App. No. 2.

DIAGRAMS

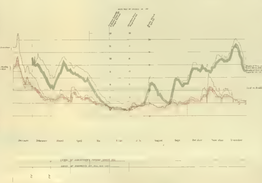
Delivered in by Mr. *J. S. Penny*, 7 May 1868.

Diagram showing the Daily Heights of Water on Jamestown Lower Sill and Rooskey Upper Sill, for the Year in which the Highest Flood occurred previous to the Works, and also for the Year in which the Highest Flood occurred subsequently.—(*See opposite.*)

Diagram showing the comparative Daily Heights of Water on Rooskey Upper Sill, before and after the Works were executed, for the Months of June, July, August, and September.—(*See opposite.*)

DIAGRAM SHEWING THE DAILY HEIGHTS OF WATER ON JAMESTOWN LOWER SILL AND ROOSKY UPPER SILL

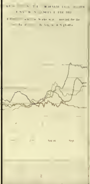
For the year in which the highest Flood occurred previous to the Works and also for the Year in which the highest Flood occurred subsequently



NOTE. The highest Flood before the Works were executed at Jamestown Lower sill is shown thus

Do.	Do.	Do.	at Roosky Upper sill	Do.	▬
Do.	after	Do.	at Jamestown Lower sill	Do.	▬
Do.	Do.	Do.	at Roosky Upper sill	Do.	▬

SCALE OF HEIGHTS — 10 FEET TO AN INCH



April 1868

Appendix, No. 3.

LETTER addressed to the Committee by Mr. *James Penny*.

App. No. 3.

In looking over my evidence, I find that, not being favoured with an opportunity of explaining as fully as I should wish, in reply to some of the questions put to me, my answers, without further explanation, might lead to erroneous conclusions, and with the view to prevent such, I beg to submit the following statement, in the hope that your Honourable Committee may be pleased to place it on the Minutes.

I will take the questions seriatim that I conceive require explanation.

CARNADOE BRIDGE.

Question 640.—There were five arches formerly over the old causeway, three of which had the bottom surface of their waterway below the present summer level: the five arches, however, acted in winter or summer floods. The following is the relative capacity, in superficial feet, in the first place, of those arches, and, in the second, of the present bridge erected by the Shannon Commissioners:—

	Former Arches.	Present Bridge.
	Superficial Feet.	Superficial Feet.
To Summer Level - - -	58	210
To Winter Level - - -	257	356

So that the present bridge has a waterway of 152 superficial feet at summer level, and 99 at high winter flood, more than the former arches.

GRANGE MILL.

652. This mill-wheel was affected with backwater in December 1864 for two days, and was almost stopped, at which time the water was 7 ft. 8 in. on the Upper Sill, Old Lock, Rooskey. Since the navigation works were completed, a period of 19 years, there was only two years that the water was above 7 ft. 8 in., viz., 1852 and 1853; and two years that it was at that height, namely, 1864 and 1866; but a glance at my tables will show that there was no year anterior to the execution of the works that it did not attain a much greater height than 7 ft. 8 in., and I have been informed that the wheel was stopped, not unfrequently for a fortnight at a time then, by backwater.

In this and the preceding case in my evidence I have given already the data upon which I have based these deductions.

663 and 677. I fear I have to some extent misinterpreted those questions. In the first place I did not ask from the proprietors of the land any expression of opinion. It was from the occupiers and persons I met on the lands or contiguous to them, who had long experience, both anterior and subsequent to the Shannon operations, and who were well qualified to give an opinion. Their statements, however, had no reference as to "satisfaction" or "contentment," but solely and specifically as to whether the lands were improved or otherwise by the works which were executed. I will briefly state the number of persons I consulted for the Meelick Reach, and the general result of their experience.

MEELICK REACH.

1st Division: Athlone to Shannon Bridge (distance, 14 miles).

689. Ten persons have expressed their opinion in this division:—

1st. That the lands that used to be swamps is now good grazing ground.

Another: That he considers that the lands that he holds to be twice as valuable to him as it was before the lowering of the Shannon; and that he believes all the low lands along the Shannon, so far as he has seen, to be as much benefited as his.

Another: That the Kenna callows at Clanmacnoise (Seven Churches) were some years eight months, and others six months, covered with water, and were let in conacre from 1 *l.* to 2 *l.*, conditionally (*i. e.*, if they could be saved); they are now let (1865) from 4 *l.* to 6 *l.* in conacre.

Another: That the Cappaleitrim callows (which are very extensive), the choicest portion of them were before the works let at from 20 *s.* to 30 *s.* in conacre; they bring now from 4 *l.* to 6 *l.* an acre; and the same remark also applies to the Crevagh callows.

2nd Division: Shannon Bridge to Banagher (eight miles).

Nine persons in this division have expressed their opinion.

One states that the callows are much enhanced in value. That before the works, although the return from some of them (high callows) was very great—it was one year in five—that the crops could be saved. Has 10 acres of callow, to which the lowering of the Shannon has added an acre. The part thus added he has often fished in. That lands that were swamps and useless beyond the immediate influence of the Shannon floods, he has reclaimed about 60 acres of such land, and which is now valuable tillage; he was enabled to effect this improvement from the fall created by the Shannon operations.

App. No. 3.

Another: That the sinking of the Shannon has done great good to the callows; places which were sloughs or swamps, that you would almost sink up to your waist, in the middle or driest part of summer, are now the best of land, all brought about by the sinking of the Shannon.

Another: That before the Shannon was sunk, "I bought the goodwill of Bullock Island" (about one mile above Banagher). "I could not get 10 *s.* an acre for it in conacre. It is now let at from 4 *l.* to 5 *l.* per acre, being the best of meadow, and safe from floods; the years 1860 and 1861 excepted; in the latter year the hay was lost."

I may here add that in the August flood of 1861, all the crops within the six months' flood line previous to the works were destroyed.

I have already given evidence as to the other division in this reach, Banagher to Meelick.

As regards the next reach, Meelick to Killaloe, there has been the same general improvement, and I have received the testimony of several parties to that effect. The best callows near to Portumna, under the most favourable circumstances, was let at 2 *l.* an acre, now brings 6 *l.* an acre.

(signed) *Jas. S. Penny.*

14 May 1868.

Appendix, No. 4.

LETTER addressed to the Committee by Mr. *Kelley*.

App. No. 4.

Sir, London, 16 May 1868.

I UNDERSTOOD that I had been summoned to attend the Committee of Inquiry into the management of works on the River Shannon in Ireland, of which you are Chairman, for the purpose of my cross-examination on evidence given by me in 1865 and 1866, on neither of which occasions did any one supporting views adverse to my evidence venture to cross-examine me.

During more than a week I waited on your Committee in expectation of being called, and have been relieved without cross-examination by the parties at whose instance I have been summoned; in the meantime I have heard the examinations of Messrs. Forsyth and Penny, officers of the Board of Works, through whose statements insinuations are thrown out, and inferences attempted to be drawn as it were, in contradiction of my evidence; which course I must say is unfair, not only towards myself but towards the ratepayers of the county of Roscommon, as I am debarred the opportunity of giving evidence in refutation of them.

Having no other course left open to me but to protest against such statements, I beg to do so.

Mr. Forsyth says that the alterations from the original designs at Athlone were beneficial to the drainage as well as to the navigation, and also for the purposes of economy; that the drainage and navigation at that place have been prejudiced by the change is too well known to require remark from me at present; but how he reconciles his statement that such change was done for economy must be guessed at, as there was, according to a Parliamentary Return of the Board of Works in 1865, a sum of 104,276 *l.* expended at Athlone, though the estimate was only 87,697 *l.*, being an over expenditure of 16,579 *l.*, unless he protects his statement by an admission that the expenditure at Athlone has been erroneously put forward in the Return, as it has been proved to have been in the case of expenditure at the shoal of Clerhaun (*see* my Evidence of April 1866, page 16).

He also states that the bridges over the River Shannon unauthorised to be removed, were thrown down and new ones built in their stead for a less sum than it would have cost to underpin them; this is too absurd to require observation, further than that he does not pledge himself to the fact by any other data than by reference to accounts found by him in the office of the Board of Works, and which after their perversion in the case of Clerhaun can hardly be relied upon.

That Lough Allen does not require a harbour, that throwing down the permanent bridge of Carrick-on-Shannon was necessary, and that there has not been fallacy in the accounts at Clerhaun, I distinctly deny.

That the statement of having passed in a boat through the cut at Derry Carne without impediment, and with 5 feet deep of water in it, is no answer to my evidence: viz. (No. 74), that instead of 140 feet wide and 6 feet 6 in. deep, it is only 80 feet wide and 5 feet deep.

Another statement made by Mr. Forsyth I beg to object to as evidently incorrect: viz., that one arch built by the Commissioners at Carnadoe of 35 feet span, could be as effective in passing water as the former bridge of 53 feet waterway, as depth is not an element in the case, there being no fall.

Relative to the cut at Carreen near Lanesboro', where, in my evidence of 1866, No. 173, page 8, I mention that instead of the cut being made 154 feet wide and 6 feet 6 inches deep, it is only 80 feet wide and 4 feet 9 inches deep, and that great impediment to the navigation results.

Mr. Forsyth, the engineer for the Board of Works, who conducts the scrutiny into my evidence, gives the Committee the very explicit professional answer that the cut of 80 feet wide and 4 feet 9 inches deep is as effective for navigation as if it had been made 154 feet wide and 6 feet 6 inches deep, and that he passed through it in a steamer and met no obstruction; he must have passed during a calm and when the water was not low in Lough Ree; and he subsequently states that to widen and deepen the channel is one of the first steps to navigation.

Mr. Forsyth informs the Committee that there is no statement in any document he has examined, or in anything he has heard, to show that on an estimate of 170 *l.* for the shoal of Clerhaun, 6,000 *l.* had been expended; because there is no credit given in any place, and that if so the Commissioners must have paid it out of their own pockets; those who know less of the facts than I do might credit this statement; that the books of the Commissioners or the Parliamentary Return made by the Board of Public Works may have evaded notice of the facts, and suppressed the extravagance of cost, may be quite correct; but how could the engineer of the Board of Works have avoided seeing in my evidence of 1866, page 16, a statement, as well as proofs from the Reports of the Commissioners, that 6,000 *l.* at least must have been expended at Clerhaun; it is to be remarked that he preferred not to notice this fact, though he has observed upon matters of much less moment to the public; the suppression of the facts of over expenditure on the lower reaches of the Shannon works has proved a serious loss to the people who were so heavily taxed on the upper reaches.

The levels of summer water have been raised at Tarmonbarry weirs and at Rooskey, and not kept to the Parliamentary level, as stated by Mr. Forsyth; he states that on the division of Rooskey it does not rise twelve or thirteen inches higher than formerly. That it does so I beg to reassert is proved by facts on the ground, independent of the very variable and unsatisfactory tables on which Mr. Forsyth's opinion is based; the marks of the rise of summer water over the Parliamentary level, as noted

App. No. 4. noted in my evidence, stand the uncontradicted memorials of facts, and must hold a position in truth far outstripping any set of registers held only in the hands of the Board of Works.

That Rooskey weir is backwatered by Tarmon weir is not the fact; the fall over Rooskey weir at summer level is 3 feet 4 inches; the cause of backwater is from want of removal of Bird Island, which stands quite convenient to the weir, and interrupts the discharge.

The narrowness of Clooneen cut and the unfinished state of other works, coupled with the weir at Tarmon; besides there is a wickerwork fishing weir fixed close to the regulating weir, which diminishes the discharge, helps to keep up the water, and adds to the destruction of property on the Rooskey level; the present weir stands nearly parallel with and not at right angles to the current; therefore, it is badly calculated to afford a free discharge of the waters, and does not discharge as much water within a given time as the weir originally designed at the neck of the lake above would have done.

To my former evidence, that I have no faith in registries, now produced by the Board of Works, where facts contradict them, I adhere; if they are properly got up and intended to be properly used, why should the Board have issued orders to their registrars at the several stations along the river not to permit anyone to see them; I have been refused access to them, though directed to make inquiries relative to them by the grand jury of the county of Roscommon, and the order of the Board of Works to that effect produced.

Mr. Penny stated that the bridge built by the Commissioners at Carnadoe has not less waterway than that pulled down by them, and produced a diagram to prove so. The diagram to those unaccustomed to scientific studies is calculated to confuse, and is not a candid way of meeting the question. The old bridge had 53 feet ope of waterway; the Commissioners' new bridge is only 35; there is no fall for the water except the surface rise caused by the impediment which the narrowness of the new bridge creates. The ope of waterway is the measure of capacity to pass water in both cases exclusive of depth.

Mr. Bateman has given evidence that at Carnadoe "another arch of 35 feet span is necessary, as the present 'water space' of the new bridge is not sufficient to pass the water without impounding it to an inconvenient height above the bridge."

Mr. Penny, by a diagram, endeavours to show that the new road referred to in my evidence of 1866, has not been flooded by any Act of the Commissioners, and also by another diagram of a very unintelligible nature to prove that the water does not rise so high on the water-wheel at Grange mill, which is on the same level, as it did before the Shannon works commenced. His reference to measurements of height from low summer water of the lake to the axle of the water-wheel, and his diagram in explanation thereof, as proof of his assertion, is inconclusive, and calculated to mislead; he admits that he did not examine the wheel at the time of high flood, which is the only time at which the extent of injury to the working of it could be ascertained.

Why he should compare level of low water with the axle of the water-wheel, instead of comparing height of water with the lower buckets of the wheel, can only be imagined; it is clear that his diagram cannot afford any information; that the lower buckets of the water-wheel at Grange mill are injuriously back-watered, and the land of the tenantry along the borders Kilglass and Grange Loughs damaged, requires no further evidence on my part, as Mr. Bateman's statement, already quoted, that the Commissioners built the bridge at Carnadoe too narrow is sufficient.

The road Mr. Penny refers to was laid out by me previous to the execution of the Shannon works, on ground never previously flooded; the road is now flooded, caused by the over height and bad discharge of Rooskey weir, and the insufficient waterway of Carnadoe bridge.

Along the frontage of the River Shannon, for a distance of over 60 Irish miles, extending from Shannon bridge to Lough Allen, I had frequent intercourse with the proprietors and occupiers during the entire period from the completion of the Shannon works to the present time, and I never heard any other feeling expressed than that of dissatisfaction and disappointment as to the flooding of the land and defective state of the navigation.

Touching on every minor point alluded to would have stretched this paper to too great a length, I have therefore omitted several, yet, I presume, it will be found that I have noticed enough to show that my evidence before your Committee in 1865 and 1866 has been consistent and remains uncontradicted, notwithstanding the very earnest efforts which have been made to the contrary.

I have, &c.
(signed) *John Kelly.*

To the Right Hon. Colonel *F. French*, M.P.,
&c. &c.

REPORT

FROM THE

SELECT COMMITTEE

ON

SHANNON RIVER;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMITTEE,

MINUTES OF EVIDENCE,

AND APPENDIX.

Ordered, by The House of Commons, *to be Printed*,
18 *May* 1868.

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